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Understanding, recognising and preventing dehydration in older residents living in care homes: a mixed methods study

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Abstract

Aim
To recognise and understand how to prevent water-loss dehydration occurring in older people living in care homes.

Background
Water-loss dehydration is common and linked to poor drinking, but prevention is likely to be multi-faceted.

Methods
Three independent studies investigating hydration care in older care home residents were conducted and the findings integrated (mixed methods, convergent parallel design):

- Diagnostic accuracy of clinical signs and symptoms of dehydration.
- Systematic review investigating effectiveness of interventions and associations of modifiable environmental factors on improving fluid intake and/or hydration status.
- Qualitative study involving residents, families and care-staff in focus groups, exploring challenges and facilitators in hydration care.

Results
In the diagnostic accuracy study, 188 residents (mean age 85 years, 66% women) were recruited from 56 care homes. Clinical signs and symptoms were ineffective in identifying older people with dehydration. The 23 included studies in the systematic review addressed a range of strategies at carer, institutional and societal (‘macro’) levels to improve fluid intake and hydration status, but high risk of bias in many studies meant findings were inconclusive. Three themes emerged from the qualitative study: ‘meanings and experiences of drinking’, ‘caring roles’, and ‘tensions and barriers to successful drinking’. Integrated findings identified residents’ and families’ contributions to residents’ hydration care and preventing dehydration requires a multi-faceted approach. The researcher-led quantitative studies of the systematic review indicated how macro factors may impact on hydration care (along with institutional and carer-led factors). Findings from the diagnostic accuracy should inform national guidelines at the macro level. The qualitative study provided experiential perspectives and insights into relational care between each care level and how these have positive and negative impacts on residents’ drinking.

Conclusion
Fluid intake is a physiological necessity to prevent dehydration. Supporting care home residents to drink involves multi-levels of care and is a social experience.

(300 words)

Medline medical subject headings (MeSH): *aged; beverages; dehydration; diagnostic tests, routine; drinking; geriatrics; long-term care; osmolar concentration; qualitative research; residential facilities; review, systematic.*

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Glossary

Care home

In this thesis, ‘care home’ refers to institutions which provide residential, nursing and/or specialist dementia care for people aged >65 years. Care homes provide sleeping accommodation, drinks, food and care for groups of people living together.

In Chapter 5 (Systematic Review) I have used the broader definition of 'long-term care facilities' to allow for international differences (defined in section 5.3.3).

Dehydration

There are a number of different types of dehydration described in the literature and a number of different terms used to describe dehydration, including the following:

- intracellular dehydration
- hyperosmotic-hypovolemia
- hypohydration
- dehydration with minimal salt loss
- extracellular dehydration
- iso-osmotic-hypovolemia
- volume depletion
- dehydration with salt-loss

Many authors use the global term of 'dehydration' to refer to some or all of the above, whilst others make clear distinctions regarding the particular type of dehydration they are discussing or investigating. When reporting on the works of other authors, I use the term for dehydration which they have used.

The type of dehydration under investigation in this thesis is 'water-loss dehydration' as defined by the US Dehydration Council[1] because this describes how people who drink insufficiently to replace body-water losses become dehydrated which may lead to a state of hypohydration. Water-loss dehydration is characterised by raised serum osmolality.

Drinking

The definition of 'drinking' is: “*To take (a liquid) into the mouth and swallow.*”[2]

In the English Language the term 'drinking' is sometimes used to relate to alcohol intake specifically. In this thesis, when I use the term 'drinking' I use the more general definition of imbibing fluids orally, which may include alcohol, but is not restricted to alcohol.

Toileting

In health care 'toileting' is a commonly-used term to describe the care provided to assist a dependent person with his/her elimination needs. This is the manner in which I have used the term in this thesis.

Chapter 1: Introduction

1.1 Contributions

I have written this chapter.

1.2 Aim and introduction to Chapter 1

Older people living in care homes are seen as being at risk of dehydration and that this is due to not drinking sufficiently to replace fluid losses. Whilst taking in fluids is a physiological necessity, the act of drinking is a behavioural and social experience, as Patricia Crotty remarked:

> *"The act of swallowing divides nutrition's 'two cultures'. The post swallowing world of biology, physiology, biochemistry and pathology, and the pre-swallowing domain of behaviours, culture, society and experience."*[3] *(page 109).*

Dehydration, due to lack of fluids, can occur at any age, but the risk increases with increasing age due to physiological changes associated with ageing and an increasing number of co-morbidities and medications, resulting in the regulatory systems functioning less efficiently[4]. If these are accompanied by other factors, such as diminishing functional and cognitive abilities to institute the appropriate behavioural responses to access drinks, then there is a greater likelihood of inadequate fluid intake. All these factors are more likely to be found in older people living in care homes.

1.3 Investigating water-loss dehydration in older care home residents

Dehydration relates to an imbalance between fluid intake and losses with many different physiological types of dehydration being described (section 2.5), depending on which body compartment is affected and the underlying causation mechanisms, but in its broadest sense, dehydration can be described as:

> *".... a clinically relevant decrease of an individual's optimal total body water amount and may occur with or without loss of electrolytes".*[5] *(page 590)*

In this thesis, I will be discussing water-loss dehydration, where fluid intake is insufficient to replace fluid losses resulting in a reduction in total body water or hypohydration[6,7]. This is because water-loss dehydration, due to poor drinking, is the most common type of dehydration to be found in older people living in care homes, and therefore it is frequently viewed as being a preventable condition[8,9]. However, ensuring residents remain hydrated is more complex than simply ensuring that adequate drinks are available, ready to be consumed. Rather, prevention requires a multi-faceted approach addressing physiological and behavioural mechanisms.

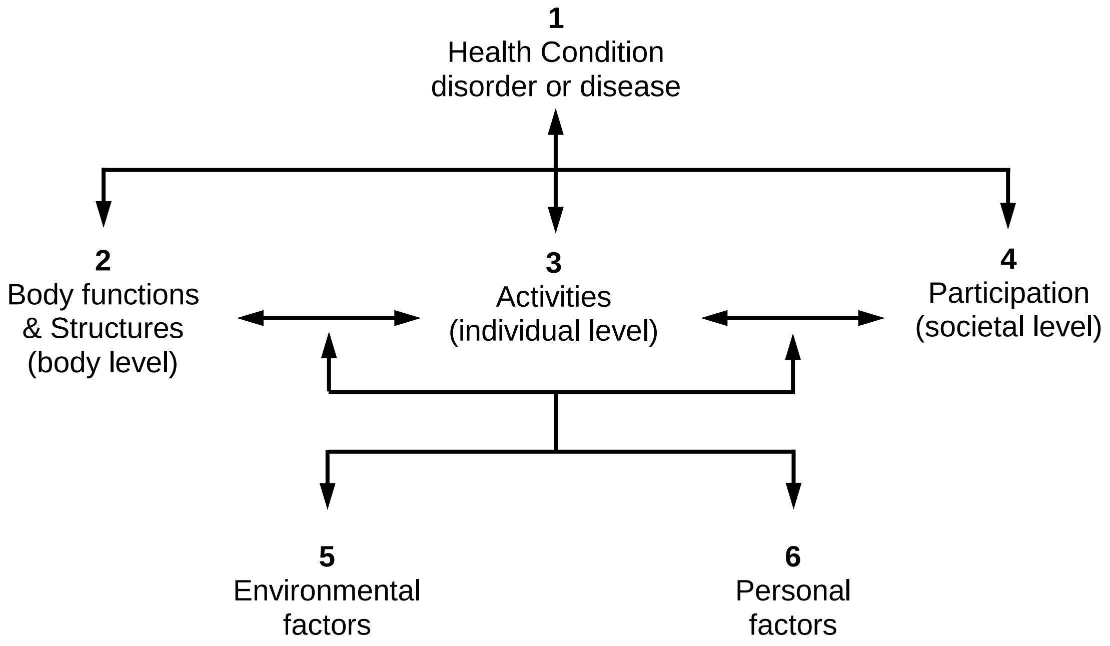
Conceptually, preventing dehydration can be understood within the framework of the World Health Organization's (WHO) International Classification of Functioning and Disability and Health (ICF) which provides a conceptual basis for understanding disability and health in a number of areas, including interdisciplinary research (Figure 1-1)[10]. This framework (Figure 1-1) illustrates how diseases and disorders need to be understood at the physiological or 'body level', but physiological disorders can impact on an individual's functioning ('individual level') and their participation in social activities ('societal level'), and within the context of internal personal and external environmental factors.

Thus, as seen in Figure 1-1, water-loss dehydration is a physiological condition (Item 1) which affects various body systems, some of which may be observable as clinical signs and symptoms (Item 2). Water-loss dehydration is linked with personal discomfort and the development of further morbidities which may impact on a resident's function (Item 3) and an individual's ability to participate socially (Item 4). As well as the physiological changes associated with age, a major contributory factor to water-loss dehydration is inadequate drinking, which may result from personal factors (for example unwillingness to drink because of anxieties relating to micturition, Item 6) or environmental factors (such as insufficient drinks rounds, Item 5).

Research is required at all these levels to increase our understanding of how to prevent water-loss dehydration, but this thesis will investigate whether observable signs and symptoms are indicative of water-loss dehydration in older care home residents particularly, as well as aiming to understand more fully the personal and environmental factors which impact on residents' drinking. These investigations will inform future developments of preventive strategies, which are likely to be complex, so that individual residents' needs can be met with the appropriate care within a care home setting.

Preventing water-loss dehydration may improve residents' quality of life by minimising discomfort and reducing the risk of hospitalisation and mortality[11] although evidence linking dehydration with risk of developing comorbidities is less clear (section 2.7).

Figure 1-1: International Classification of Functioning, Disability and Health (ICF)



1.4 Drinking and hydration care in care homes

People living in care homes are more likely to have functional and cognitive difficulties impairing their abilities to drink. Additionally, living in a care home, per se, means that residents are dependent on staff for drinks, whether that is in the broader sense of the care homes supplying drinks, or literally where staff provide physical assistance to help someone drink. Thus, for care home residents, drinking involves much more than simply satisfying a human need[12], it becomes a supported activity involving each individual resident and their network of carers, and the ensuing social interactions become part of the process of determining what, when and how much a resident drinks. Further, providing drinks is a component of hydration care for the care homes.

Care home managers have a responsibility to provide hydration care and this is regulated by the Care Quality Commission (CQC, independent regulator of health and social care in England and Wales). Care home managers have to demonstrate that they are compliant with regulation 14: ‘Meeting nutritional and hydration needs’[13]. This regulation states:

> *“The intention of this regulation is to make sure that people who use services have adequate nutrition and hydration to sustain life and good health and reduce the risks of malnutrition and dehydration while they receive care and treatment.*

> *“To meet this regulation, where it is part of their role, providers must make sure that people have enough to eat and drink to meet their nutrition and hydration needs and receive the support they need to do so.*
>
> *“People must have their nutritional needs assessed and food must be provided to meet those needs. This includes where people are prescribed nutritional supplements and/or parenteral nutrition. People's preferences, religious and cultural backgrounds must be taken into account when providing food and drink.”*[13]

The CQC provides further guidelines on implementing this regulation[13]. Whilst these guidelines mention that care home providers are expected to encourage and support people to drink and to conduct hydration assessments to ensure that their hydration needs are being met, there is little guidance as to *how* carers are expected to encourage or support residents or *what* format these hydration assessments are expected to take (section 14(4)(a) of the CQC regulation).

Thus, management of older people’s hydration needs in care homes is an integral aspect of care, regulated by the CQC and encompasses support to drink, as well as assessments to ensure that drinking is adequate to meet hydration needs.

1.5 Hydration care in care homes, is it a problem?

The very fact that hydration care is highlighted within the regulatory remit of the CQC, indicates that maintaining hydration in residents living in care homes can be problematic, and has frequently been highlighted as such by both research findings[8,14] and media reports (see for example: The Daily Mail[15] and the BBC News[16]). Further, hydration is one of the six aspects of fundamental care specifically named in the Nurse’s Code of Practice[17], again highlighting its importance.

The problems associated with providing adequate hydration care arise from both the residents and the care home: older residents have difficulties drinking and maintaining fluid balance, whilst care home providers are experiencing difficulties in addressing those needs, and in both instances the difficulties are multi-factorial in nature. For ageing residents, there are physiological reasons which may impact on their ability to maintain an adequate water balance and this could be accentuated by medications and/or comorbidities. There may be physical difficulties accessing drinks or cognitive impairments where remembering to drink or recognising what to do with an offered drink is impaired. Psychosocial barriers to drinking may include anxieties about micturition, disliking the drinks provision or simply being unaware of the importance of drinking. Difficulties from the care home providers' stance may arise from an inability to provide sufficient staff, staff who have insufficient knowledge to provide the appropriate care or lack of resources to provide appropriate drinking aids or other essential equipment.

Research is needed within the care home environment to understand more fully what the issues may be in providing adequate hydration care[18]. Staff require help to find solutions to the problems they encounter in ensuring their residents drink well and stay hydrated, and anecdotally, many have expressed a need to know what else they can do. Findings from research conducted in other populations, settings or care areas cannot be expected to be applicable to improving hydration care in older people living in care homes. Improving hydration care for older residents living in care homes requires its own body of research, where studies addressing questions relevant to this population, setting and care need can be conducted.

As hydration care in older people living in care homes is an emerging area of research, the purpose of this thesis was to conduct preliminary research investigating current practices to provide evidence-based findings to underpin future developments in this very important area. Using the CQCs guidelines for addressing Regulation 14, three points describing the core elements of hydration care for residents in care homes, stood out as being worthy of closer investigation at this preliminary stage[13]. These are:

- Section 14(1):
  "Providers should have a food and drink strategy that addresses the nutritional and hydration needs of people using the service."
- Section 14(4)(a):
  "Nutrition and hydration assessments must be carried out by people with the required skills and knowledge. […]
  "Staff must follow the most up-to-date nutrition and hydration assessment for each person and take appropriate action if people are not eating and drinking in line with their assessed needs."
- Section 14(4)(d):
  "People should be encouraged to eat and drink independently. They should receive appropriate support, which may include encouragement as well as physical support, when they need it."

These three points describe the core elements of hydration care for residents in care homes. Other points in the CQCs guidelines are prescriptive (e.g. access to water), refer to specific topic areas (e.g. end of life care) or relate to implementation of policies. Whilst these are important, and need to be addressed, they build on the core elements described above.

The CQC combines nutrition and hydration care under the same regulation, recognising that there are similarities between these two aspects of care, but as they refer to both aspects individually, the CQC is also acknowledging that they are distinct from each other. This thesis is concerned with hydration care only.

1.6 Research to address the guidelines

This thesis will address each of the three core points identified above (a food and drink strategy, up-to-date nutrition and hydration assessments, encouragement to eat and drink independently) as described next.

1.6.1 Section 14(1) of the CQCs guidelines

Section 14(1) states: *"Providers should have a food and drink strategy that addresses the nutritional and hydration needs of people using the service."*

There are many different strategies which care homes adopt to address their residents' hydration needs, but the effectiveness of these strategies is not always clear. The most appropriate research method of evaluating the effectiveness of different strategies which have been investigated under research conditions, is to conduct a systematic review. Compared to narrative or literature reviews where an expert reviews the available evidence and draws his/her own conclusions, systematic reviews are a more rigorous process which attempt to provide more reliable findings by minimising bias. This is done by searching for, and collating evidence that fit pre-specified eligibility criteria to answer a specific research question[19]. Systematic reviews are thus replicable and more transparent, and easily updated as new research appears. By systematically reviewing different strategies aiming to improve hydration care, this work will provide care home providers with evidence-based care.

1.6.2 Section 14(4)(a) of the CQCs guidelines

> ***Section 14(4)(a) states:*** *"Nutrition and hydration assessments must be carried out by people with the required skills and knowledge. […]*
> *Staff must follow the most up-to-date nutrition and hydration assessment for each person and take appropriate action if people are not eating and drinking in line with their assessed needs."*

'Hydration assessment' indicates that there must be ways of assessing hydration status in older people living in care homes, and care home staff are expected to know about these and conduct the appropriate tests accordingly. As there are no nationally agreed guidelines in the UK about how hydration status should be assessed, it is left to care homes to determine their own choice of assessment tools, and evidence their use when inspected by the CQC. Many assessments are described and advocated in reputable textbooks, journals and websites (section 2.9.2).

Questioning the validity of these assessments as effective screening or diagnostic tools of water-loss dehydration in this population has only recently been addressed. Many of the assessments used as part of care have not been validated at all in older people, some may have been validated in younger adults or children and assumed that they will then work in older people, whilst other assessments are simply used because they are thought to work.

1.6.3 Section 14(4)(d) of the CQCs guidelines

Section 14(4)(d) states: *"People should be encouraged to eat and drink independently. They should receive appropriate support, which may include encouragement as well as physical support, when they need it."*

Encouraging people to eat and drink independently with the appropriate support raises many questions about how this should be undertaken, how needs are assessed, and in what ways residents may be involved in those decisions. To address these kinds of questions, residents and staff should be asked to describe these kinds of issues in a way that allows their thoughts and experiences to be 'captured' and presented. Whilst a survey would accrue some of these views, surveys are researcher-led, whilst a qualitative approach provides an emic ('insider') perspective of what residents and care staff think about these issues. Focus groups are one method of engaging with residents and their network of carers to explore these views. Exploring insider's perspectives in this way provides insights which may be salient to many care home providers faced with the difficulties of ensuring that their residents remain well-hydrated.

1.7 The research problem

The research problem identified is that water-loss dehydration is a physiological process, related to inadequate fluid intake to replace fluid losses. Supporting residents to drink comes under the remit of hydration care, an essential component of care for residents living in care homes. This care sometimes falls short, as evidenced by research reports, the media and anecdotally, leaving residents uncomfortable, dehydrated and vulnerable to hospital admission and death. Current strategies need to be improved and evidence-based care, underpinned by good quality research, should contribute to these improvements. There is a dearth of research in this area. Hydration care is multi-faceted, so I have referred to the CQCs guidelines to identify key areas of research as a starting point. Three key areas were identified, each requiring a different research method, so a mixed-methods approach was adopted as the design for this thesis.

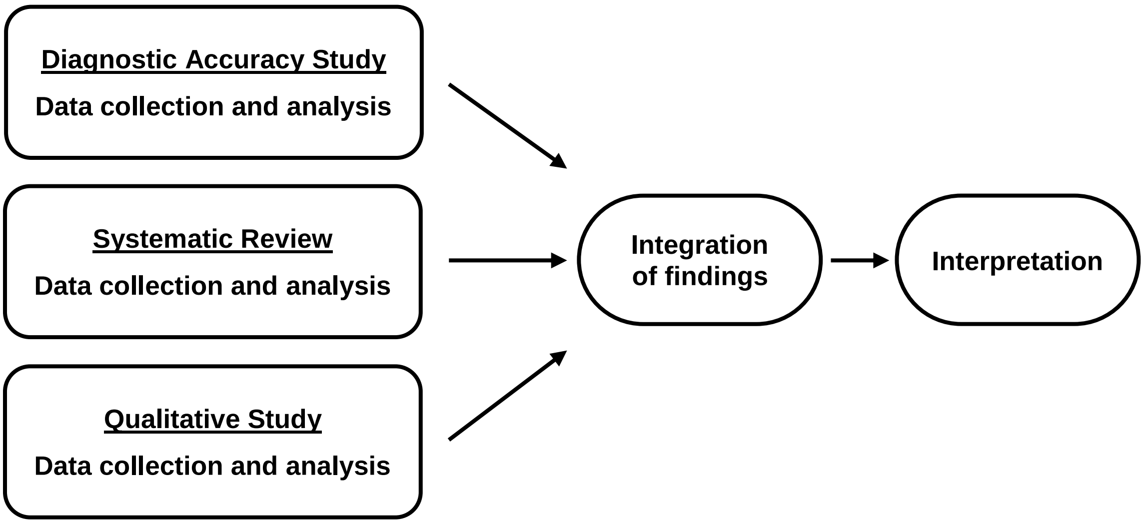
1.8 Mixed Methods approach

A mixed methods approach is a pragmatic methods approach which encompasses quantitative and qualitative research methods and the resulting data is integrated to provide breadth and depth in a single study to provide a better understanding of a research problem[20]. Being pragmatic, taking a mixed methods approach means accepting that there is more than one methodology to describe reality[21], with the added advantage that mixing methods enables flexibility and a multi-dimensional view when trying to understand and explain the complexities and contexts of social experiences[22]. This view is appropriate when trying to understand the complexities around hydration care for older people living in care homes.

To realise the mixed methods approach, I chose to adopt a Convergent Parallel Design[20], where three studies would be undertaken and the data analysed before integrating the findings (Figure 1-2).

Each of these three studies will be discussed in detail in separate chapters in this thesis. The chapter outlines are described in the next section.

Figure 1-2: The 'Convergent Parallel Design' used in this mixed methods study



1.9 Thesis overview

This thesis, investigating hydration care for older people living in care homes, reports on the design, implementation and findings of three studies and how they integrate as a mixed methods study. The outline of each chapter is described in the following sections.

Chapter 1: Introduction

This chapter has identified the overarching research problem and the rationale for this thesis and how it will be addressed. The rationale for adopting three component studies within a mixed methods approach using a convergent parallel design has been described.

Chapter 2: The literature review

This chapter describes the physiology of water balance in the human body and the effects of increasing age on these homeostatic mechanisms. I briefly describe the different types of dehydration and how to recognise it in older people before reviewing the evidence associating risk factors with developing dehydration as well as the evidence linking dehydration with adverse health outcomes.

The literature on recommended fluid intakes and definitions of 'inadequate fluid intake', and measurement issues regarding fluid intake is reviewed. The role of care homes, as providers of hydration care is discussed, and the way in which fluid needs are seen as a physical need and a social activity.

Chapter 3: Aims and objectives for thesis

This chapter will describe the research problems to be addressed in this thesis as well as the purposes and aims. The objectives of the thesis will be outlined and how these will be met by the three component studies.

Chapter 4: Diagnostic accuracy study

A diagnostic accuracy study will investigate the diagnostic accuracy of commonly-used clinical signs and symptoms to screen for water-loss dehydration in older people living in care homes. This chapter will describe the background to the study, its aims, methods, results and conclusions.

Chapter 5: Systematic review

A systematic review will assess the efficacy of interventions and modifiable environmental factors on increasing fluid intake or reducing dehydration risk in older people living in long-term care facilities. This chapter will describe the background to the systematic review, its aims, methods, findings and conclusions.

Chapter 6: Qualitative study

A qualitative study will investigate the perspectives of residents and their network of carers around hydration care using qualitative methodology and focus group methods. This chapter describes the background, its aims, methods, findings and conclusions.

Chapter 7: Discussion and conclusions

This chapter summarises the findings from each of the three studies prior to integrating and synthesising the findings. The methods used to integrate the findings is described followed by the conclusions reached from the synthesis which will be interpreted in relation to current research. Recommendations for care and future research will be proposed.

1.10 Summary and conclusions from Chapter 1

This chapter has identified the overarching research problem and the rationale for this thesis and how it will be addressed. The rationale for adopting three component studies within a mixed methods approach was described. The format of the thesis has been outlined.

The next chapter reviews the literature around dehydration and drinking in older people living in care homes.

Chapter 2: Literature Review

2.1 Contributions

I have written this chapter.

2.2 Aim and introduction to Chapter 2

This chapter will review the literature regarding dehydration and hydration care in older people, with particular reference to those living in care homes.

2.3 Role of water in the body

Water is essential to sustain life, and without it, death will occur within days, although much longer periods of survival have been reported in exceptional circumstances[7]. Water deficit is the only body nutrient to have such devastating effects in such a short time period, so ensuring that the body has sufficient water is a daily concern which cannot be delayed, thus distinguishing it from other dietary nutrients.

Water is a major component of our bodies, comprising 55-75%, depending on age, gender, body mass index, health status and activity level. A newborn baby's bodyweight is approximately 75% water, and this decreases to around 55% in older people[23]. Water is distributed intra- and extracellularly (approximate ratio is 66% to 33%, respectively), and of the extracellular water, approximately 25% is intravascular (representing 8% of the total body water)[1]. Lean tissue contains more water (about 70%) than fat tissue (about 20%), so that a higher percentage of fat tissue results in a lower percentage of body water overall which is more pronounced in women[24]. In older people, the decline in total body water (TBW) seems to result from a predominant decrease in intracellular water (ICW) due to declining muscle mass, rather than in extracellular water (ECW)[25].

2.4 Homeostatic control of body water

As the most abundant chemical in the human body, water plays a central role in the regulation of cell volume, nutrient transport, waste removal, thermal regulation as well as providing a medium for biological reactions[1]. To conduct these functions effectively, the body has to maintain a steady fluid balance – ensuring that the body has the correct amount of fluid for its needs, and this, in turn, depends on the electrolytes found in the body tissues (particularly sodium and potassium). Body water volume is tightly controlled, and under normal conditions in younger adults this fluctuates by less than 2% per day[6] although greater fluctuations (>3%) have been observed in older adults[26]. In healthy individuals, there is a constant on-going homeostatic process, where changes to the internal or external environments precipitate the appropriate physiological regulatory processes and behavioural responses[27]. Physiological processes include the thirst response and alterations in kidney function, both of which depend on osmoregulation to respond to changes in electrolyte concentrations which become more concentrated when the body becomes dehydrated. These stimulate a behavioural response to drink to replenish the diminished fluids, and a reduction in urinary losses to minimise fluid losses.

2.5 What is dehydration?

Dehydration is described in different ways, but there is general agreement that dehydration is the process of losing body water which may lead to hypohydration, where the body is in water deficit[1,6,28,29]. Dissolved electrolytes within body fluids exert an osmotic effect across cell membranes, so depending on where the water deficit occurs (intra- or extracellularly) this determines the type of dehydration and the direction of the osmotic gradient in which water will move to equalise the osmotic concentrations of intra- and extracellular fluids. Cell membranes are freely permeable to water, but selectively permeable to solutes.

The United States (US) Dehydration Council, recognising that physiological definitions of dehydration can be restrictive in clinical practice, described two types of total body water loss which are applicable in clinical settings: water-loss dehydration which is a reduction in total body water due primarily to a water deficit, and salt-loss dehydration resulting from both a salt and water deficit[1]. The Dehydration Council go on to describe water-loss dehydration as being either hypernatraemic or hyponatraemic if hyperglycaemia is present, whereas salt-loss dehydration is hyponatraemic (although it could be isotonic on occasions)[1]. Water-loss dehydration is characterised by hyper-osmolality and salt-loss dehydration by normal or lowered serum osmolality. Both are directly measurable or calculable using established equations based on electrolytic content of serum and/or plasma.

The US Institute of Medicine's Panel on Dietary Reference Intakes for Electrolytes and Water[30], together with Cheuvront and Kenefick[31], describe dehydration in a similar manner, although using slightly different terms. In Europe, The European Food Standards Agency (EFSA) identifies three types of dehydration according to the ratio of fluid to electrolyte loss, two of these (isotonic and hypertonic) relate to the US descriptions, but the EFSA also include a further type – hypotonic dehydration[28]. The different types, terms and descriptions of dehydration are presented in Table 2-1 where I have used the terminology of the US Dehydration Council (water-loss and salt-loss dehydration) as the main headings, because the Dehydration Council's description of water-loss dehydration is the term I have used in this thesis to describe the type of dehydration I refer to throughout. It is worth noting that whilst describing dehydration as distinct entities, different types may occur concurrently[6].

Water-loss dehydration and salt-loss dehydration are regulated by two different mechanisms, although not completely separated as there is overlap between them. Water-loss or intracellular dehydration is regulated mainly by changes in the effective osmolality intravascularly which are detected centrally by osmoreceptors in the hypothalamus, whilst salt-loss dehydration (extracellular dehydration or hypovolaemia) is mainly regulated by blood volume, so that a reduction in blood volume is detected by baroreceptors in the aortic arch resulting in vasoconstriction in the skin, gut and renal vasculature[27].

In this thesis I refer to 'water-loss dehydration' as defined by the US Dehydration Council[1] because this describes how people who drink insufficiently to replace body-water losses, become dehydrated which may lead to a state of hypohydration. Thus, whenever I use the term 'dehydration' in this thesis I am referring to the process of water-loss dehydration, unless specifically qualified.

The Dehydration Council states that disease and medications are the most common underlying causes of dehydration, followed by lack of water intake[1]. However, all these three factors are prevalent in older people living in care homes, and these, together with other risk factors for developing dehydration, will be discussed further in section 2.6.

Table 2-1: Definitions of dehydration

Definition of the US Dehydration Council[1]		**Equivalent definitions**	
Terms	**Description**	**Term**	**Description**
Water-loss dehydration	Reduction in total body water, mainly in the ICF. This is primarily due to a water deficit, and can be either hypernatraemic or hyponatraemic if hyperglycaemia present.	**1. Cheuvront**[6] (i) Intracellular dehydration *or* (ii) Hyperosmotic-hypovolaemia *or* (iii) Hypohydration *or* (iv) Dehydration with minimum salt-loss	When the concentration of lost body fluids is hypo-osmotic with respect to plasma, the ECF is hyperosmolar, an osmotic gradient results, with water moving from the ICF to the ECF, resulting in intracellular dehydration.
		2. EFSA[28] Hypertonic dehydration	Water-loss exceeds salt loss, characterised by an osmotic shift of water from the ICF to the ECF.
Salt-loss dehydration	Volume depletion, refers to loss of water from the ECF and vasculature. Reduction in total body water is primarily due to both a salt and water deficit. It is generally hyponatraemic, although can be isotonic on occasions.	**1. Cheuvront**[6] (i) Extracellular dehydration *or* (ii) Iso-osmotic-hypovolaemia *or* (iii) Volume depletion *or* (iv) Dehydration with salt-loss	When the concentration of lost bodily fluids is iso-osmotic with respect to plasma, the ECF contracts due to extracellular dehydration, but there is no osmotic gradient for water to move from the ICF.
		2. EFSA[28] (i) Isotonic	Isotonic loss of both water and solutes from the ECF. There is no osmotic water shift from the ICF to the ECF.
		(ii) Hypotonic	More sodium is lost than water. There is an osmotic shift of water from the ECF to the ICF

2.6 Effects of ageing on body hydration

Age-related changes make older people more vulnerable to dehydration due to overall decreases in total body water together with increased risk of fluid losses and decreased fluid intake[32]. Increased fluid losses are mainly due to physiological processes, whereas decreased fluid intake is due to physiological hypodipsia (lack of thirst) and behavioural factors[33]. Fluid losses occur transcutaneously (sweating), via respiration, obligatory urinary losses and the faeces. In some disease states these can be increased and further losses can occur due to vomiting and diarrhoea (such as in gastroenteritis), infections (causing fever) and excess diuresis (as in diabetes).

2.6.1 Physiologic risk factors for dehydration

In younger adults, fluid balance is tightly regulated to ensure that input and output are balanced. The primary mechanism for achieving this involves the kidneys, osmoreceptors in the hypothalamus, hormone-mediated mechanisms and thirst[34]. As we age, fluid balance regulation is less efficient, so the body is less able to compensate for fluid imbalances, and dehydration is the consequence, with its own sequelae.

2.6.1.1 The kidneys

Between the ages of 30 and 90, the kidneys decrease in size by approximately 40%. This is accompanied by a loss of nephrons and glomeruli and a decrease in renal vasculature, so that perfusion and glomerular filtration rate both decline, resulting in diminishing ability to reabsorb solutes and water leading to reduced urine-concentrating ability so that fluid is lost from the body, even when dehydrated[27,35].

2.6.1.2 Anti-diuretic hormone, ADH (also known as vasopressin)

Osmoreceptors in the hypothalamus detect an increase in plasma osmolality, this provokes a sensation of thirst and fluid-seeking behaviour. In addition, the pituitary is stimulated to release ADH (made in the hypothalamus, but stored in the pituitary) which stimulates the kidneys to reabsorb water. ADH release may also be stimulated by angiotensin II which results from a reduction in circulating intravascular volume[36] (section 2.6.1.3). As we age, ADH is increased and osmoreceptors become more sensitive to it, but the ageing kidney does not respond as well, so the net result is a diminished ability to concentrate urine[37].

For older people with dementia, these mechanisms are even more likely to function inefficiently, thus making this population even more susceptible to dehydration[37].

2.6.1.3 Renin

Renin, a hormone secreted by the kidneys in response to hypovolaemia when extracellular volume and mean arterial pressure decrease, causes circulating angiotensin I (made in the liver) to be converted to angiotensin II (facilitated by angiotensin-converting enzyme, ACE, found in the lungs). Angiotensin II instigates vasoconstriction (so increasing intravascular pressure), causes ADH to be released and stimulates the adrenal cortex to secrete aldosterone, which promotes sodium reabsorption and potassium excretion in the kidneys, increasing plasma osmolality, and therefore water absorption[38]. This system is compromised with ageing, with less renin being secreted by the kidneys and consequent reduced sodium reabsorption and concentration of urine[27,36].

2.6.1.4 Thirst

Thirst is the conscious perception to ingest fluids when plasma osmolality is increased or blood volume is decreased:

- Increased plasma osmolality causes intracellular dehydration in the osmoreceptors found in the anteroventral wall of the third ventricle of the hypothalamus. This causes ADH to be released with its consequent effects on the kidney to increase water absorption.
- Decreases in the extracellular circulating volume is identified by volume–sensitive receptors in the cardiac atria, carotid sinus and baroreceptors in the aortic arch. These activate the osmoreceptors in the hypothalamus, and again ADH is released. This is a less potent mechanism than hyperosmolality[39].

Thirst is a sluggish response, and not well adjusted to rapid losses of water even in younger age-groups[36]. In older people, diminishing thirst sensation (physiological hypodipsia) has been observed and seems to result from reduced sensitivity of the osmoreceptors in the hypothalamus thus requiring a higher osmotic threshold before experiencing thirst. There is also a reduced sensitivity to thirst and satiety in response to changes in circulating volume by the volume–sensitive receptors and baroreceptors[40]. This can be exacerbated by drugs causing hypodipsia which should be carefully controlled in this age group[41].

2.6.1.5 Decrease in total body water

There is a net loss in total body water (TBW) of around 10–15%, with the average middle-aged adult having a TBW content of 60-65%, which drops to around 50-55% by aged 75 years[4,37]. This is because muscle mass generally decreases with increasing age, and as muscle holds around 40% of total body water, and fat cells contain low quantities of water, there is a reduction in the lean body mass to body weight ratio, and a higher fat ratio results in older people having reduced TBW[42]. This is more apparent in those with either higher or lower body mass indices. This overall reduction in TBW means that when faced with the stressors of disease and environmental factors which increase the risk of dehydration, the risk of hypohydration is enhanced because existing TBW levels are already reduced.

2.6.2 Physical and behavioural factors risk factors for dehydration

A number of physical and behavioural (both modifiable and non-modifiable) factors may contribute to an increased risk of dehydration in older people. Studies investigating risk factors have taken place in the community, care homes and on admission to hospitals, they vary in size and design and do not always adjust appropriately for confounders. Further differences occur regarding the methods selected to assess dehydration or fluid intake, with many of the measures no longer considered robust. Table 2-2 provides details of those studies investigating risk factors for dehydration in older people using robust methods of dehydration assessments: serum or plasma osmolality, osmolarity, tonicity or the International Classification of Diseases (ICD) Codes. Table 2-3 provides details of those studies investigating risk factors associated with low fluid intake where fluid intake was recorded over a 24-hour period.

2.6.2.1 Diuretic use

Diuretic use is common in older people, and their use has been associated with increased risk of dehydration, possibly because of the way in which they impair the body's electrolyte balance[43]. Other medications which may also interfere with the body's fluid and electrolyte balance are angiotensin-converting enzyme inhibitors used to treat hypertension and congestive cardiac failure, and nonsteroidal anti-inflammatory drugs which inhibit prostaglandin synthesis, associated with reduced renin and aldosterone[4].

Table 2-2: Risk factors associated with dehydration amongst older people[*]

Risk factor	Finding	Sample size	Study design and setting	Author, year
Age	>65 years increased risk	14,855	Cross-sectional, community-dwelling	Stookey, 2005[44]
	>85 years increased risk	14,855	1. Cross-sectional, community-dwelling	Stookey, 2005[44]
		731,695	2. Retrospective cohort of hospital admissions	Warren et al, 1994[45]
	>90 years increased risk	1,737	Cross-sectional, community-dwelling	Stookey, 2005[46]
Sex	Females increased risk[#]	14,855	1. Cross-sectional, community-dwelling	Stookey, 2005[44]
		1,737	2. Cross-sectional, community-dwelling	Stookey, 2005[46]
		731,695	3. Retrospective cohort of hospital admissions	Warren et al, 1994[45]
Ethnicity	Increased risk for:			
	1. Afro-American	46,185	1. Case-control, hospital admissions	Lancaster et al, 2003[43]
	2. Afro-American & Hispanic	14,855	2. Cross-sectional, community-dwelling	Stookey, 2005 [44]
	3. Afro-American	731,695	3. Retrospective cohort of hospital admissions	Warren et al, 1994[45]
Diuretic use	Increased risk	46,185	Case-control, hospital admissions	Lancaster et al, 2003[43]
Low eGFR	Increased risk	188	Cross-sectional, care home	Hooper et al, 2015[47]
Obesity (BMI>30kg/m^2)	Increased risk	1,737	Cross-sectional, community dwelling	Stookey et al, 2005[46]
Cognition	Dementia diagnosis Increased risk	18	Controlled trial, hospital-based	[†]Albert et al, 1989[48]
	Low MMSE Increased risk	188	Cross-sectional, care home	Hooper et al, 2015[47]
Diabetes	Increased risk	188	1. Cross-sectional, care homes	Hooper et al, 2015[47]
		1,737	2. Cross-sectional, community dwelling	Stookey et al, 2005[46]
≥2 chronic conditions	Increased risk	1,737	Cross-sectional, community dwelling	Stookey, 2005[46]
Hypertension	Increased risk	1,737	Cross-sectional, community dwelling	Stookey, 2005[46]

(continued on next page)

Risk factor	Finding	Sample size	Study design and setting	Author, year
≥2 prescriptions	Increased risk	1,737	Cross-sectional, community dwelling	Stookey, 2005[46]
Infections	Increased risk	363,895	2^y analysis of national care home data set, cross-sectional	Dyck, 2004[49]
Fever	Increased risk	363,895	2^y analysis of national care home data set, cross-sectional	Dyck, 2004[49]
Oral problems (not clearly defined)	Increased risk	363,895	2^y analysis of national care home data set, cross-sectional	Dyck, 2004[49]
Functional impairment	Increased risk	1,737	Cross-sectional, community dwelling	Stookey, 2005[46]
Raised environmental temperature	Increased risk	415,862	Retrospective analysis of hospital admission and outpatient data	[†]Josseran, 2009[50]

[*] *Table devised by D. Bunn in paper by Hooper and Bunn*[51]*, and adapted further for this thesis by D. Bunn.*

[#] *Warren et al found an increased risk for white females 65-79 years only. Males were at higher risk at other ages and ethnicities.*

[†] *Unadjusted study.*

Table 2-3: Risk factors associated with low fluid intake amongst older people

Risk factor	Finding	Sample size	Study design and setting	Author, year
Increasing age	Increased risk	99	Cross-sectional, care homes	†Gaspar, 1999[52]
	No difference	40	Cross-sectional, nursing home	†Chidester, 1997[53]
Greater number of medications in 24hr	Decreased risk	40	Cross-sectional, nursing home	†Chidester, 1997[53]
Urinary incontinence	Increased risk	57	Cross-sectional study in long-term care unit, psychogeriatric unit & geriatric admissions unit	†Armstrong-Esther, 1996[54]
Assistance with eating	Increased risk	99	Cross-sectional study, based in care home	†Gaspar, 1999[52]
	No difference	40	Cross-sectional, nursing home	†Chidester, 1997[53]
Fewer ingestion sessions	Increased risk	99	Cross-sectional study, based in care home	†Gaspar, 1999[52]
Greater functional ability	Increased risk	99	Cross-sectional study, based in care home	†Gaspar, 1999[52]
Increased dependency	Increased risk	57	1. Cross-sectional study in long-term care unit, psychogeriatric unit & geriatric admissions unit	†Armstrong-Esther, 1996[54]
		24	2. RCT, dysphagic stroke patients in acute hospital	Whelan, 2001[55]
		40	3. Cross-sectional, nursing home	†Chidester, 1997[53]
No impairment of speech	Increased risk	99	Cross-sectional study, based in care home	†Gaspar, 1999[52]
Impaired communication	Increased risk	40	Cross-sectional, nursing home	†Chidester, 1997[53]
Absence of drooling	Increased risk	99	Cross-sectional study, based in care home	†Gaspar, 1999[52]
Impaired cognition	Increased risk	57	1. Cross-sectional study in long-term care unit, psychogeriatric unit & geriatric admissions unit	†Armstrong-Esther, 1996[54]
		40	2. Cross-sectional, nursing home	†Chidester, 1997[53]

†*Unadjusted study.*

In Table 2-2, the few studies that have investigated risk factors appear to be consistent in their findings that increasing age, female sex, poor cognition and Afro-American's are at greater risk of dehydration. Two studies[46,47] identified diabetes as a risk factor, and single studies reported a range of other factors.

In Table 2-3, associations with low fluid intake were less clear, with greater number of medications associated with reduced risk, but urinary incontinence, impaired cognition, fewer ingestion sessions and absence of drooling all associated with increased risk, whilst studies investigating age, feeding assistance, communication ability and functional ability were contradictory. All of these studies were small, and unadjusted, so further investigations are required.

2.7 Comorbidities associated with dehydration

Dehydration and poor fluid intake are often described as being associated with a number of morbidities (see for example the Royal College of Nursing's Toolkit[56]), but the evidence is scant in any adult age group and even more so in older people[7]. As many diseases and conditions are multifactorial in origin, establishing a causal link between dehydration and morbidity is complex. Further, the quality of the evidence is variable, as this depends on study design, size and quality of study, the number of studies investigating the issue and the marker of dehydration used[23]. Conditions where a link has been investigated between dehydration and morbidity in older adults are discussed below.

2.7.1 Cognition

A review of the evidence in 2012 concluded that there was insufficient data to support a relationship between mild dehydration and cognitive function in older adults (mean age: 60 years), but further investigation is needed due to methodological weaknesses and inconsistent measurements between studies[57].

2.7.2 Constipation

An expert panel of the second international conference on Hydration Throughout Life agreed that there was reasonable evidence linking dehydration with constipation across age groups[58]. In older age groups specifically, a reduction in constipation following increased fluid intake was reported in two studies[59,60] included in the systematic review in this thesis although both studies were judged high risk of bias for the way in which they assessed fluid intake (sections 5.4.3.9, 5.4.3.10). In Japan, a cross-sectional, unadjusted, study including 94 people (mean age 68 years, SD:9 years; 47% women) with Parkinson's Disease had lower fluid intakes and higher rates of constipation compared to the 69 healthy controls (age and sex not reported). Fluid intake was assessed using a self-administered dietary questionnaire, but measurement details and information about the period of time over which data was collected is unknown, and constipation was defined as less than one bowel movement in three days (also self-reported)[61].

2.7.3 Coronary disease

Two prospective cohort studies have investigated links between fluid intake and coronary heart disease (CHD). In the Netherlands, no association between total fluid intake and ischaemic heart disease was observed in 120,852 people (aged 55-69 years, 52% women) followed over 10 years[62]. Although an earlier study including 20,297 people (59% women) in the US found that drinking >5 glasses water a day was associated with lower risk of fatal CHD in a six-year prospective follow-up study (mean age: 59, SD:13 in women and 58, SD:13 in men)[63].

2.7.4 Disability

In the US, a large prospective study of 561 community-dwelling older people (52% women, mean age 76, SD:4) found that the risk of disability over four years was increased in those people who had high tonicity (>300mOsm/L) at baseline compared to those with normal tonicity (285–294mOsm/L; RR: 2.1, 95%CI: 1.2–3.6), after adjusting for a number of confounders, including age, sex and activity level[64].

2.7.5 Decubitus ulcers

In a very small study including just eight nursing home residents with decubitus ulcers (5 women; mean age 66 years, SD:13), dehydration (assessed using serum osmolality) was associated with poor healing[65].

2.7.6 Stroke

Raised plasma osmolality on admission to hospital with stroke was associated with increased mortality in 167 patients (mean age 73 years, SD:12; 52% women) followed for three months, compared to those with normal osmolality levels[66].

2.7.7 Urinary tract infections

Two literature reviews assessing evidence across all ages concluded that the occurrence of urinary tract infections is associated with low fluid intake or low urine output, but there is no definitive evidence linking susceptibility to low fluid intake[23,67].

One of the included studies in the systematic review in this thesis investigated the effect of a 6-week programme to increase fluid intake on asymptomatic bacteria in a controlled study in nursing homes. On completion there was no significant difference in mean fluid intake between intervention and control groups (intervention group: 1732ml/day, SD:301 vs control group: 1548ml/day, SD:558; p=0.11), or rates of asymptomatic bacteriuria (23% vs 10%, p=0.22)[68], although the study was judged to be at high risk of bias due to the way in which fluid intake was measured (section 5.4.3.9).

2.7.8 Urolithiasis

Two literature reviews investigating urolithiasis across all age groups concluded that there was sufficient evidence linking low fluid intake with urolithiasis[23,67]. In older people, there is evidence from a US prospective cohort study with 45,619 men aged 40-75 years and 477,700 person years of follow-up, of increased risk in the lowest quintile of fluid intake (RR: 0.71, 95%CI: 0.59, 0.85) compared to those in the highest quintile[69].

2.7.9 Venous thromboembolism

Following an acute ischaemic stroke, 102 patients (mean age 70.1 years, SD: 11.9; 54% women) admitted to hospital with stroke were followed prospectively for 21 days. Those with serum osmolality >297mOsm/kg had increased odds of 4.2 (p=0.02) for developing a venous thromboembolism[70].

2.7.10 Other morbidities

An expert panel of the second international conference on Hydration Throughout Life which reported on comorbidities throughout life concluded that there was insufficient evidence to link mild dehydration or insufficient fluid intake with broncho-pulmonary disorders[71], cancer risk[72] or dental disease[73].

The evidence linking dehydration with hospital admissions and mortality in older people is accumulating, and is discussed further in the following section.

2.8 Dehydration and hospital admissions and mortality

Dehydration is associated with increased risk of hospital admissions and longer stays in older people generally, as well as in those living in care homes, although different definitions of dehydration have been used by different studies. In the UK, a case-control study investigating reasons for emergency admission to hospital for people with dementia, reported that dehydration (using ICD-10 codes) was more frequent than in age/sex matched controls[74]. In both the UK and the US, higher rates of hospital admissions with hypernatraemia have been reported for residents living in care homes compared to community-dwelling older adults[14,75].

Looking at mortality following admission to hospital for older people with dehydration, Warren et al, in the US, reported increased rates of mortality where dehydration was either the first or secondary diagnosis (using ICD-9-CM codes) compared to other diagnoses[45] and in the UK, older people who were hyperosmolar on admission had a longer hospital stay and were six times more likely to die than euhydrated individuals[76]. Similarly, in France, risk of mortality was significantly higher in older people admitted to short and long-term geriatric departments with hypernatraemia compared to those who were normonatraemic[77].

Longer term increased risk of mortality has also been reported. In the UK, 58 older patients admitted to a continuing–care unit with hyperosmolality had increased mortality over two years of follow-up[11]. More recently, in France, 48 patients admitted to hospital with hyperosmolality and followed for one year were reported to have double the risk of mortality[78], and increased mortality risk of 40% has also been demonstrated in 561 community-dwelling older adults with raised baseline tonicity who were followed for eight years[64].

Whilst several associations have been reported between dehydration (described as either hypernatraemic or hyperosmolar) and hospital admissions and mortality, observational studies such as these are not able to tease out the cause or the effect, and dehydration may well be secondary to other morbidities leading to the admission or death.

2.9 Recognising dehydration in older people

Effective screening tests which could identify older people with possible water-loss dehydration would enable a diagnosis of dehydration to be confirmed earlier so that interventions could be initiated to reverse the condition and prevent the development of further possible comorbidities.

2.9.1 Screening and diagnostic tests generally

Screening tests and diagnostic tests serve two different functions. Diagnostic tests, although rarely 100% accurate, aim to determine whether a person has, or does not have the condition under investigation when they present with symptoms, signs or a positive screening test. Diagnostic tests tend to be more invasive than screening tests, they often require specialist equipment and training and so are more costly. Conversely, screening tests tend to be less invasive, are easier to administer, more acceptable to the person undergoing the test and are generally cheaper. Thus, screening tests are used when a condition is suspected, especially when there is a high risk of developing the condition (prevalence of the condition in the population under investigation is high), or the risk is low but the consequences of developing the condition are serious but preventable. Positive screening tests indicate that further testing is required to confirm diagnosis, whereas a negative test provides reassurance that the suspected condition is unlikely to be present. Thus, the sensitivity and specificity of diagnostic and screening tests differ to reflect these differing requirements, with diagnostic tests requiring greater specificity (to correctly identify those without the condition) whereas screening tests require higher sensitivity (so as not to miss any potential cases)[79].

2.9.2 Screening and diagnostic tests in dehydration

Assessing dehydration is complex because of the dynamic nature of fluid regulation. Even so, a wide range of tests have been described, some of which are diagnostic, some are used to screen and some are used in experimental situations[29,80]. These tests will be discussed further below.

2.9.2.1 Assessments of total body water

The three common measures of body water assessment are spectroscopy using deuterium oxide (heavy water containing an isotope of hydrogen), bioelectrical impedance analysis (BIA) and body weight.

Deuterium oxide enables the water content of the body to be monitored using infra-red spectroscopy and so is useful in experimental situations to monitor water turnover rates. In a small study involving 22 community-dwelling older people and 15 care home residents, Leiper et al reported that daily turnover rates were 27% lower in the care home residents[32].

BIA uses electrical current to measure conductivity of body tissues and there are several different methods including measurements of total body resistance, multiple-frequency BIA and bioelectrical spectroscopy (BIS). These assessments are not validated in all populations and they are also prone to measurement error (due to operator handling and participant body habitus), so repeated measures are required. Further, inconvenience and costs of equipment and operator training mean that they are unlikely to be useful in many care homes[34,81].

A change in weight of >3% body weight over 1 week may indicate a change in hydration status. This indicator of dehydration seems to be an effective measure in children and athletes[29] but is less robust in older people[81]. This may be because dehydration in older people is often a gradual rather than an acute process, and weight changes may fluctuate even in well hydrated older people due to other factors such as constipation and oedema, so that rapid weight loss may not be a good indicator of dehydration[26].

2.9.2.2 Biochemical tests of dehydration

Biochemical tests include serum and plasma osmolality and osmolarity, serum tonicity, serum sodium and BUN:creatinine ratio, all of which require a venous blood sample. Tear, salivary and urine osmolality, using the appropriate samples, can also be measured.

2.9.2.2.1 Serum and plasma osmolality

Osmolality is a property of a particular solution and is independent of any membrane. In the ECF, the primary solutes determining plasma osmolality are sodium, glucose and urea, with potassium, glucose and urea determining the ICF’s osmolality[82]. In normal conditions, sodium is the most important of the ECF solutes, and potassium in the ICF.

Serum and plasma osmolality are measured directly from a venous sample of blood, using the depression of freezing point (resulting from increased osmoconcentration of osmotically active electrolytes, mainly sodium and potassium, and solutes of glucose and urea)[82]. Both measures reflect the number of dissolved particles (whether they are able to permeate cell membranes or not) per kilogram of serum. Both are measured in milliosmoles/Kilogram (mOsm/kg). In adults the normal range is considered to be 275-294 mOsm/kg; 295-300mOsm/kg suggests impending water-loss dehydration and >300mOsm/kg suggests current water-loss dehydration[1,30]. There are small differences between serum and plasma osmolality. Serum is the blood component after all white and red blood cells have been removed, and contains water (approximately 93%), electrolytes, antibodies, antigens, nutrients, proteins and other water-soluble substances. Plasma is similar in composition, but the crucial difference is that it does not contain fibrinogen. The US Institute of Medicine (IOM), based on evidence from NHANES III (National Health and Nutrition Examination Survey), reported that serum and plasma osmolality values were ‘nearly’ identical, with small differences accountable by handling and analytical factors[30].

The IOM states that as plasma or serum osmolality are closely controlled by homeostatic mechanisms and is the primary physiological signal used to regulate water balance, then these measures are appropriate to assess water state, such that if there is decreased fluid intake, this leads to increased concentration of ECF, water moves across the cellular membrane from the ICF, resulting in cellular dehydration. This is detected by osmoreceptors in the hypothalamus, which trigger thirst and fluid-seeking behaviour, as well as releasing ADH from the posterior pituitary to increase water reabsorption in the kidneys and decrease urine volume. Thus, in normal conditions serum osmolality will remain stable, rising when either fluid intake is insufficient or kidney concentrating power is insufficient to restore fluid balance, thus indicating dehydration[30], in particular intracellular dehydration[31,83]. However, it is possible that because the body’s regulatory mechanisms strive to maintain a stable plasma or serum osmolality, then osmolality may not be the best indicator of change in hydration status[84]. Disparate views such as these highlight the complex nature of dehydration and its assessment.

2.9.2.2.2 Calculated serum osmolarity

Calculated serum osmolarity, an estimation of the osmolar concentration of serum is proportional to the number of particles per litre of solution[46]. It is estimated using equations which combine serum concentrations of (some or all of) sodium, potassium, urea and glucose and other cations. A large number of osmolarity equations are used clinically, and these have been investigated to establish which is the most useful to screen for dehydration in older people. The equation by Khajuria and Krahn[85] (1.86 x $[Na^+ + K^+]$ + 1.15 x glucose + urea +14; all in mmol/L) has been identified as having the highest diagnostic utility in older people[86].

2.9.2.2.3 *Serum tonicity, or effective osmolality*

Serum tonicity reflects cellular hydration status and the distribution of body water between ICF and ECF[46] and is equal to the sum of the concentrations of the solutes which have the capacity to exert an osmotic force across the membrane. Whereas calculated serum osmolarity is proportional to the number of particles (sodium, potassium, glucose, urea) per litre of solution, tonicity is NOT affected by urea, as urea moves freely through the cell membrane. Tonicity is a property of a solution in reference to a particular membrane.

2.9.2.2.4 *BUN:creatinine ratio*

BUN:creatinine ratio is the ratio of blood urea to creatinine and both are related to protein metabolism and are filtered by the kidneys[46]. Both urea (blood urea nitrogen, BUN) and creatinine are freely filtered by the glomeruli in the kidneys, but urea reabsorption in the proximal tubules is regulated in response to ADH, whereas creatinine reabsorption remains the same, thus, the BUN:creatinine ratio will increase in dehydration. However, its usefulness as a measure of dehydration is dependent on full kidney function, and as poor kidney function is found in a high proportion of frailer older people its use as a marker of dehydration is questionable[87]. Blood urea and creatinine are also affected by other systemic conditions including congestive cardiac failure, bleeding, sarcopenia and increased protein intake[1,88].

2.9.2.2.5 *Raised sodium levels*

Raised serum or plasma sodium (>145mmol/L, range 135-145mmol/L)[30] occurs when fluid intake is less than fluid losses, and so can be used as a marker of dehydration, but as changes are less apparent it is a less precise form of measurement for dehydration[28].

2.9.2.3 *Clinical signs and symptoms of dehydration*

Many clinical signs and symptoms are used routinely by health practitioners to screen for dehydration as they can be undertaken quickly and with minimum equipment and training (Table 2-4).

The majority of these clinical signs and symptoms require minimal equipment and minimal training skills to recognise them, so can easily be conducted as part of routine care in many settings, including care homes. In care homes particularly, many of these tests are acceptable to care staff, because they can be undertaken without needing a nursing or medical directive, and results are immediately available so that a course of action can be readily instituted. They are also generally acceptable to residents as they cause minimal discomfort.

Table 2-4: Commonly-used signs and symptoms of dehydration

System	Sign or symptom
Mouth	Dryness of tongue and oral mucosa Tongue furrowing Tongue coating Decreased saliva Ropey saliva Dry or cracked lips Blueness of lips
Eyes	Hypotonia of the ocular globes Reduced tear secretions
Skin	Reduced skin turgor Dryness of skin Reduced axillary and palmar sweating
Cardiovascular	Increased capillary or vein refill time Flattened neck veins Hypotension Orthostatic hypotension Tachycardia
Urinalysis	Volume Colour Specific gravity
Other	Pyrexia Increased respiratory rate
Symptoms	Thirst Headache Confusion Lethargy Agitation

The use of these clinical signs and symptoms is recommended widely in medical and nursing textbooks and journals (see for example: The Royal Marsden Hospital Manual of Clinical Nursing Procedures[89]; Royal College of Nursing Hydration Toolkit[56]; Begum 2010[27]; Docherty 2010[90]; Hodgkinson 2003[91]; Shepherd 2013[92]; Mentes 2004[93] as well as the National Health Service's own websites[94]). Closer examination of the evidence underpinning the use of these signs and symptoms reveals that many of these signs and symptoms have been validated in specific populations, but then incorporated into general clinical practice and care without a sound evidence base for their validity in any other setting or population, in particular older people living in care homes. Some clinical examinations have been validated to screen for hypovolaemia[95] and are assumed to be effective in water-loss dehydration, and where signs and symptoms have been validated in older people living in care homes, some have used a reference standard which would no longer be considered robust[77,96].

A recently-published Cochrane systematic review examined the diagnostic accuracy of 67 clinical signs and symptoms for detecting water-loss dehydration in older people (≥65 years), using three different reference standards: directly measured serum or plasma osmolality, calculated serum osmolarity or weight change[97]. For both directly measured osmolality and calculated osmolarity, the primary cut-offs were >295mOsm/kg and >295mOsm/L, respectively (which included impending dehydration with a cut-off of 295-300mOsm/kg [osmolality] or 295-300mOsm/L [osmolarity] and current dehydration with cut-offs of 300mOsm/kg or 300mOsm/L for osmolality or osmolarity respectively). For weight change the cut-off was a loss of >3% body weight. Minimum sensitivity and specificity was pre-set at 60% and 75% respectively. Three studies and a further 21 datasets were included to investigate the diagnostic utility of a range of clinical signs and symptoms. Only BIA resistance at >50kHz and two other tests (expressing fatigue and missing drinks between meals) demonstrated any utility to detect water-loss dehydration and these results were not consistent across all studies where they were assessed. BIA resistance >50kHz with sensitivities and specificities >60% and 75% respectively, were reported in two out of four studies; expressing fatigue was assessed in three studies, but only one study reported satisfactory sensitivity and specificity and missing drinks between meals was only assessed in one study. The review concluded that there was limited evidence that any individual clinical symptom, sign or test or combination of tests had any diagnostic utility and therefore they should not be relied upon to assess presence or absence of dehydration to indicate water-loss dehydration in older people. Studies published since the final search dates in this review have reached the same conclusions[98,99].

2.10 Fluid intake in older people living in care homes

Drinking is the primary method by which we take in fluids to maintain hydration and prevent dehydration[6,100] and drinking is defined by the Oxford Dictionary as:

> *'To take (a liquid) into the mouth and swallow.'*[2]

When the physical ability to drink is compromised, other methods can be used, such as nasogastric feeding, subcutaneous infusion (hypodermoclysis), intravenous (IV) infusion and percutaneous endoscopic gastrostomy (PEG) feeding. For the purpose of this thesis, only drinking, as defined above, will be considered.

Individual water needs vary widely, depending on medications, comorbidities, body size and composition, environment, physical activity and personal preferences[6]. Official guidelines exist but it is not always clear how these were derived. In the UK, The Caroline Walker Trust, who provide guidelines for the Food Standards Agency, suggest that an older person (aged >65 years) should drink 1.5 litres of fluid per day (L/day)[101]; whereas the Food Standards Agency itself recommends 1.2L/day[102]. A later recommendation by the European Food Safety Authority concluded that there was insufficient information available to recommend separate fluid intake requirements for the elderly, and so they recommended that they should be the same as for younger adults of 2L/day for females and 2.5L/day for males, assuming that 20% of this requirement is provided by food (equating to 1.6L/day for females and 2L/day for males to be provided as beverages)[28].

In the US and Canada, the Institute of Medicine have much higher recommended intakes of 3.7L/day total fluid intake (3L/day as beverages) for men and 2.7L/day total fluid intake (2.2L/day as beverages) for women[30]. However, in October 2015, the updated version of the Resident Assessment Instrument[1] recommended a daily fluid intake of 1.5L/day for both men and women living in long-term care facilities[103].

In addition to set fluid amounts, a number of methods based on body weight have also been described in the literature to calculate recommended fluid intakes for older people living in care homes, although there is little evidence to support these recommendations. These include:

- 1.6mL/m^2 body area (Butler, 1948 taken from Gaspar 1988[104])
- 30mL/kg body weight (Food and Nutrition Board, taken from Chidester 1997[53])
- 30mL/kg body weight, minimum of 1.5L/day[105]
- 1ml fluid/kcal energy consumed (Ahmed 1994, taken from Chidester 1997[53])
- 100ml fluid/kg for the first 10kg of body weight, 50ml/kg for the next 10kg of body weight, then 15ml/kg of body weight for the remaining kilograms of actual body weight (Skipper 1993, taken from Chidester 1997[53])

The studies by Gaspar and Chidester were both investigating the adequacy of fluid intake over 24 hours in long-term care facilities, so they provided estimates of 24-hour fluid intake and then determined how these compared to the various recommendations

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[1] The Resident Assessment Instrument (RAI) is mandated in all US and Canadian long-term care facilities. It provides details on how to comprehensively assess each resident's functional capabilities and helps nursing facility staff identify health problems.

described above. Table 2-5 describes the findings from these studies together with two more studies which assessed 24-hour fluid intake in older people living in care homes.

Table 2-5: Mean fluid intakes of older people living in long-term care

Study	Participants (n, sex, age)	Source of fluids	Mean fluid Intake, mls/24 hours (range)
Armstrong-Esther, 1996[54]	n=57 (72%♀) 68-89 years	All fluids (including drinks, soups, sauces)	Geriatric Admissions Unit: 1,141 (502-1,554) Psychogeriatric Unit: 1,118 (887-1,295) Long-term care unit: 1002 (463-1,607)
Chidester, 1997[53]	n=40 (88%♀) 65-100 years	Amount of water intake calculated from all food and drinks intake	1,632 (871-3,558)
		*Drinks intake**	*1,224 (653-2668)**
Gaspar, 1999[52]	n=99 (77%♀) mean age 85 years	Amount of water intake calculated from all food and drinks intake	1,968 (597-2,988)
		Drinks only	1,468 (500-2470)
Holben, 1999[106]	n=121 (sex not reported) 65-99 years	Amount of water intake calculated from all food and drinks intake	1,982 (894-4,656)
		*Drinks intake**	*1,486 (670-3,492)**

**Drinks intakes were not specifically reported in these studies, but drinks intakes were calculated by DB from the total water intake by assuming that ≈75% of this amount was derived from drinks (based on EFSAs guidelines that ≈75% of daily fluid requirements is obtained from drinks).*

Although there are no evidence-based guidelines of fluid intake requirements in older people, there is a general expectation that older people should be drinking ≈1.5L/day, and assuming that approximately 75% of our fluids come from drinks, then the mean fluid intakes in all of these studies is below this 1.5L/day threshold. Of greater concern is the lower levels of intake, which were as low as 463ml/day in one study[54]. However, the issue that is not clearly described in any of the studies, is how fluid intake was being measured and therefore how reliable the measurements are. Issues regarding measurement of fluid intake are discussed in the next section.

2.10.1 Patterns of drinking in care homes

There is very little description of the types of drinks served in care homes, or when they are served, although one case study report described how residents were supported to drink 1000mls by mid-morning in a specialist home caring for people with dementia. This was achieved by offering drinks on waking, whilst receiving personal care and at breakfast, which also included servings of fluid-rich foods[107].

Other studies provide few details, but some mention the provision of water-jugs 24 hours/day and drinks rounds between and with meals. The types of drinks are usually tea, coffee (often decaffeinated), milk, squash and water, except in those studies where a wider range of drinks are provided as part of an intervention[60,108–115]. Increasing our understanding of residents' drinking preferences and patterns may help residents to drink more.

2.11 Issues with measuring fluid intake

Measuring fluid intake is complex for many reasons, and the exactness required of science has to be balanced against the intrusion of obtaining these measurements and the negative effect this may have on residents' eating and drinking. The range of different assessment techniques is considerable, and differences refer to whether fluids or water intake are being assessed, whether fluids in food are counted, how these are measured, who undertakes and records the measurements, how assessors have been trained and whether interrater variability has been assessed.

Some authors choose to weigh all food and drinks intake and calculate the water content using nutritional databases, whilst others measure fluid intake from drinks alone or assess fluid intake in anything ingested orally which is liquid at room temperature. Measurement tools include weighing scales, use of calibrated cups or visual estimation. Training in the use of these tools and techniques varies, and so does the time period over which these assessments take place, with fluid intake only being measured at certain times during the day (e.g. mealtimes), daytime only, over 24 hours or longer. The more precise the measurements are, the more intrusive they are for residents, and thus the question arises as to whether the measures are a true reflection of usual drinking practices.

Awareness of measurement issues in assessing fluid intake is key to interpreting findings based on these[116].

2.12 Hydration care in care homes

In the UK, at the time of the 2011 census, 3.2% of adults >65 years, and 16.2% of adults aged >85 years, lived in care homes[117].

The CQC defines care homes as:

> "*Care homes offer accommodation and personal care for people who may not be able to live independently.*" (http://www.cqc.org.uk/).

Two types of 24-hour care are described: residential care which provides accommodation, meals and support for personal care, and nursing homes which provide additional nursing support for residents with more complex health needs from registered nurses who are on site 24 hours a day. Care homes providing dementia care may fall into either of these categories, but are not distinguished as a separate category. In this thesis, 'care home' refers to those providing residential, nursing and/or specialist dementia care for people aged >65 years except in Chapter 5 (Systematic Review) where I have used a broader definition of care homes to allow for international differences.

Older people living in all types of care homes are particularly vulnerable to water-loss dehydration due to the age-related physiological factors previously described in addition to the physical and/or mental frailty which has resulted in the need for care (section 2.6). Further, there is a dependency relationship regarding drinking, because the resident depends on the care staff to provide drinks, so that maintaining hydration is no longer just a personal issue, it is also an issue which involves the actions, views and perceptions of carers (paid employees, family and friends) as well as the wider community of catering staff, managers, health professionals, policy makers and funders.

Thus to support residents to drink well and remain hydrated requires more than an understanding of the physiological mechanisms, we need to understand more fully the relationships between residents and their network of carers, and the impact of institutional factors and wider policy issues on drinking. Further, we need to understand the viewpoints of residents and their network of carers. These insights will inform the development of more effective social and behavioural interventions and strategies to prevent dehydration.

Whilst a number of studies have investigated nutritional care in care homes, which may have included hydration care, few studies have investigated hydration care specifically in older residents, as a stand-alone area of investigation.

A systematic review investigated three objectives related to the management of oral fluid intake in older people (>60 years) living in any setting (acute, community or long-term care). The three objectives related to recognition of dehydration, risk factors and prevention. Recognition of dehydration and risk factors have been discussed in previous sections (2.6.1, 2.6.2, 2.9). Regarding dehydration prevention, this review included only randomised controlled trials (RCTs) and found just two small studies (n=39, n=16), both of which were set in long-term care facilities[114,118], and without reporting the validity or findings of these studies, the review concluded that fluids should be offered more frequently to 'bedridden' (*sic*) older adults, and additional help provided where people were uncooperative or refused to drink[91,119]. Since this review was published, hydration care amongst older people living in care homes has been the subject of increased scrutiny and a number of research studies have investigated the effect of different interventions and examined associations with modifiable environmental factors, thus it is reasonable to revisit the area, addressing a more focussed research question of investigating hydration care in long-term care facilities, due to the uniqueness of these settings.

In addition to quantitative studies, a small number of qualitative studies have investigated hydration care. One such study was undertaken in the UK by Godfrey et al in 2012, who investigated hydration care specifically, but in two settings, one of which was a care home providing personal and nursing care, whilst the other was a 'Care of the Elderly' ward in an acute hospital. This study aimed to understand the complexity of issues associated with hydration care in these settings by exploring older people's (>65 years) experiences of drinking, and health professionals' beliefs and behaviours in order to support developments in hydration care practice[120]. Utilising four methods of data collection (observations and semi-structured interviews with patients and residents, focus groups with staff and invited comments from families), six themes covering twenty-four categories were identified from the thematic analysis. The themes were: availability of drinks, pleasure of drinking, understanding the importance of hydration, help and assistance with drinking, barriers to drinking and the diminished experience of drinking. Further details about the barriers to drinking well included lack of choice and help or inconsistencies with help, poor aesthetics, dependence, loss of dignity, feeling unwell, constant reminders and an overall feeling that drinking was a chore rather than a pleasurable activity. Godfrey et al concluded that maintaining hydration is a complex interplay of factors in older people, although there was no distinction made between the two settings where the study was set and what kind of impact this may have had.

Interestingly, some issues often described as possible barriers were not mentioned, including little recognition of the effect of the social environment (institutional features, cleanliness, unpleasant odours and the impact of disruptive residents/patients or those who have unsocial mannerisms). There was also little exploration of how staff may manage hydration care in residents/patients who exhibit resistive behaviours regarding drinking and little insight into the issues surrounding micturition and incontinence. It is possible that these were not issues for the study population or that there may have been embarrassment about talking about these issues, especially as some of the patient interviews were conducted at the bedside in an open ward. Nevertheless, this is an important study as it is probably the first study to acknowledge and include the views of resident/patients regarding hydration care in the UK. Further research addressing these issues is needed.

In a second UK study, commissioned and reported by Anglian Water, staff from four care homes were interviewed (no information was provided about the type of care homes which participated or the staff involved). A narrative summary highlighted the key findings which were: lack of staff training, lack of promotional materials regarding the importance of hydration, language barriers for some staff (50% did not have English as the first language), residents remembering to drink, residents' anxieties about increased number of toilet trips if they drank more and difficulties accessing drinks (carrying and holding plastic cups)[121].

In the US, Wu involved residents in semi-structured interviews in a study investigating the meaning of food and drink for Chinese elders in US nursing homes. She reported that staff viewed eating and drinking from a biomedical perspective ('nourishment' and 'hydration' respectively) and that residents understood this approach, but disliked what they were given, did not complain and missed Chinese foods and drinks and the cultural practices associated with how they were served[122].

Other descriptive studies have focussed on observations by the research team and interviews with staff to investigate issues around poor intake.

In a six month pilot study set in the US, Mentes[123] aimed to profile residents who had poor fluid intake in order to tailor preventative strategies to their needs. Recruiting a convenience sample of 35 residents (mean age 82 years) from two proprietary nursing homes, she identified four groups of residents according to the cause of the drinking problem: 'Can drink', 'Can't drink', 'Won't drink' and 'End of Life'. She concluded that the 'Won't drink' group were at most risk of dehydration and that interventions should be developed to target each specific group. This study provided a useful basis to explore the usefulness of categorising residents in a way which may help to identify those at risk of low fluid intake and its simplicity could be a useful practical guide for care homes, although further investigation in a larger population is required. Gaspar[52], in her cross-sectional study, also reported that residents who were more functionally able (no speech impairment, absence of drooling and able to feed self) were at greater risk of inadequate fluid intake, implying that these residents may be consciously drinking less (Table 2-5).

In another study, Mentes[124] invited nursing home staff to participate in focus groups to explore their perspectives of dehydration. Using content analysis, she identified three themes: reasons for not drinking, identifying dehydration and strategies to improve dehydration. She found that physical reasons and residents refusing to drink were barriers to drinking, but she also reported that staff found that depression and loneliness were factors, and that they, as staff, may contribute to that as they lacked time to spend with residents. Staff communications were also seen as a problem which could aid hydration if improved, which were also the conclusions reported by Ullrich when observing nursing and care staff in Australian nursing homes[125].

Other descriptive studies in the US and Australia used observations and staff interviews to identify probable causes of poor hydration. Kayser-Jones concluded that clinical factors (dysphagia, pain, cognitive and functional impairment), sociocultural factors (lack of social support, language barriers, attitudes of staff) and institutional factors (poor staffing levels, staff unknowledgeable regarding feeding techniques) were the prime causes, all of which were modifiable[126]. In Australia, de Bellis observed mealtimes in six dementia units and concluded that in those units where the senior carer was resident-focussed and sensitive, junior staff interacted more with residents, both verbally and non-verbally and food and drink intake were markedly increased[127].

Also in Australia, Bernoth linked poor hydration care to ‘food hygiene’ and ‘iatrogenic malnutrition’ by interviewing families of care home residents. ‘Food hygiene’ described the unhygienic crockery and cups used to serve drinks and food, and staining of residents clothes where they had spilt drinks and food. ‘Iatrogenic malnutrition’ referred to how drinks rounds were omitted if staff were too busy, and how water bottles were supplied to all residents, but left out of reach, or if they could be reached, residents did not have the manual dexterity to open them. Bernoth also identified a lack of cultural sensitivity to accommodate individual resident’s cultural or religious needs[128].

The small number of qualitative studies which have investigated hydration care in care homes using observational, interview and focus-group methods with staff, families and residents have highlighted a number of different findings related to drinking and hydration care.

2.13 Publications arising from Chapter 2

I have co-authored five publications:

(i) Hooper L, Bunn D, Jimoh FO, Fairweather-Tait SJ. Water-loss dehydration and ageing. Mechanisms of Ageing and Development. 2014; 136-137:50-58.

I wrote section 7: 'Helping older people to prevent dehydration' and critically reviewed the complete paper.

(ii) Hooper L & Bunn DK. Detecting dehydration in older people: useful tests. Nursing Times. 2015. 111(32/33):12-16.

I wrote the section on risk factors for dehydration, including Table 2 in the paper. This table forms the basis of Table 2-2 in this chapter. I critically reviewed the complete paper.

(iii) Hooper L, Whitelock S, Bunn D. Beating dehydration – one specialist dementia home shows how to do it. Nursing Times. 2015. 111(34/35): 16-19.

I assisted in collating the information and critically reviewed the paper.

(iv) Hooper L, Bunn D. Should dehydration in older people be a marker of lack of quality in long term care provision? Quality in Ageing and Older Adults. 2014. 15(4):232-236.

I critically reviewed the paper.

(v) Hooper L, Jimoh F, Bunn D. Clinical Nutrition in Care Homes. Network Health Dietitians. 2014. 98:33-34.

I critically reviewed the paper.

2.14 Summary and conclusions from Chapter 2

A review of the literature has established that water is an essential bodily component and when water loss exceeds fluid intake, water-loss dehydration results. Older people, and particularly those living in care homes, are more at risk of developing water-loss dehydration for physiological, behavioural and social reasons and this is associated with an increased risk of hospital admission and death, although there is insufficient evidence to link dehydration with other morbidities.

Serum (or plasma) osmolality is the most suitable test of water-loss dehydration as a one-off diagnostic tool, although repeated measures are required to assess whether osmolality is also a good indicator of the more steady state of hypohydration. Evidence for the validity of clinical signs and symptoms to screen for water-loss dehydration requires further investigation. Fluid intake cannot be easily measured, because measurement tools become more invasive as the level of precision increases.

Fluid intake in older care home residents is deemed inadequate, although there are no evidence-based guidelines for recommended fluid intake requirements in older people.

Investigators have begun to explore the kinds of issues and associations which have a positive and negative effect on fluid intake and dehydration, whilst the effects of a number of interventions have been studied. These studies have been undertaken using different study designs, settings and outcome measures. The only systematic review investigated randomised trials across three settings, and was published some time ago[91], so with the increase in the number of studies, a systematic review to assess current evidence would provide a starting point to direct future studies.

Few studies have investigated emic factors such as the perspectives of residents, families and staff regarding drinking and hydration care, so their views are important to explore and understand when thinking about supporting residents to drink well.

The next chapter will identify the aims and research questions for this thesis and the component studies, and outline the objectives for addressing these.

Chapter 3: Aims and Objectives

3.1 My contribution

I have written this chapter.

3.2 Aim and introduction to Chapter 3

The research question, aim and objectives of the thesis as a whole will be described, followed by the individual research questions, aims and objectives for each of the three component studies included in this thesis.

In Chapters 1 and 2, I discussed how older people, particularly those living in care homes are at risk of developing water-loss dehydration and that this is due to insufficient fluid intake to replace fluid losses. Drinking is the way in which the majority of fluids are taken into the body, but this becomes a supported activity in care homes. Drinking, as part of hydration care is regulated by the CQC, but there are few directions on how to implement the guidelines, including how to support residents to drink well and so prevent dehydration. Supporting residents to drink well is likely to be multi-factorial and not dependant on any one single factor, thus research which recognises and incorporates a multifactorial approach, as in mixed-methods, has the potential to produce evidence-based findings which could be readily applicable to the care home setting.

3.3 Thesis research question, aim and objectives

The research question to be addressed by the thesis is:

> How can we understand, recognise and prevent dehydration in older residents living in care homes?

The aim for this thesis is:

> To adopt a mixed-methods approach to investigate the ways in which quantitative and qualitative research approaches can combine and increase our understanding, recognition and prevention of dehydration in older care home residents.

The purpose of this thesis is:

> To provide research-based evidence which will benefit and support residents to drink well and prevent dehydration.

The objectives for this thesis are:

1. To identify the research problems and formulate a research question.
2. To describe the way in which each research problem will be addressed using the component studies.
3. To describe the rationale for a mixed-methods approach and how the studies will combine to address the aim of the thesis and answer the research question.
4. To integrate the findings of the three individual studies to provide an overall meta-inference which addresses the research question.

3.4 Research questions, aims, purpose and objectives for the component studies

These are described for each study in the order they appear in this thesis: the diagnostic accuracy study (Chapter 4) the systematic review (Chapter 5) and the qualitative study (Chapter 6).

3.4.1 The Diagnostic Accuracy study

The research question for the diagnostic accuracy study is:

> What is the diagnostic accuracy, reliability and feasibility of use for commonly-used clinical signs and symptoms to screen for water-loss dehydration in older people living in care homes, when using serum osmolality as the reference standard?

The aim for this study is:

> To investigate the diagnostic accuracy of commonly-used clinical signs and symptoms ('index tests') of water-loss dehydration when compared to a robust reference standard (serum osmolality) to determine their utility for use by care home staff working with older people.

The purpose of this study is:

> To provide care staff with a portfolio of valid and reliable signs and symptoms of water-loss dehydration which would enable care staff to identify residents requiring additional support with drinking.

The objectives for this study are:

- To recruit and work with staff and resident Advisory Groups within care homes.
- To identify which clinical signs and symptoms ('index tests') to include, and to establish how each test should be conducted.
- To establish the reliability of each test.
- To compare the diagnostic accuracy of each test with the reference standard (serum osmolality).
- To recruit 200 care home residents to the study.
- To discuss the feasibility of conducting any potentially useful index test with Advisory Group members.
- To report the findings in line with STARD (Standards for Reporting of Diagnostic Accuracy) guidelines[129].

3.4.2 The Systematic Review

The research question for the systematic review is:

> Among older people living in long-term care, which interventions are effective or which modifiable environmental factors are positively associated with increased fluid intake and/or hydration status?

The aim for this study is:

> To conduct a systematic review following the Cochrane Collaboration's guidelines, to assess the effectiveness of interventions and examine the associations with modifiable environmental factors to improve fluid intake and/or hydration status in older people living in long-term care.

The purpose of this study is:

> Identification of effective interventions or strong associations with modifiable environmental factors would provide research evidence to inform care practices to support older residents to drink well and prevent dehydration.

The objectives for this study are:

- To recruit a review team to undertake duplication of each stage in the review.
- To define terms, develop the search strategy, write and publish the protocol.
- To identify studies meeting the inclusion criteria.
- Abstract data and assess risk of bias.
- Synthesise findings.
- To report the findings in line with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines[130].

3.4.3 The Qualitative Study

The research question for the qualitative study is:

> Amongst residents, their families and care staff, what experiences, views and perceptions influence their approach to supporting residents to drink well to prevent dehydration?

The aim for this study is:

> To explore the views and experiences of residents, families and staff to understand issues which may help and/or hinder residents to drink well, from the experiential perspective of those directly involved.

The purpose of this study is:

> Understanding the facilitators and barriers in supporting residents to drink well from the perspectives of those involved, would inform the development of more relevant hydration care strategies.

The objectives for this study are:

- To determine the qualitative approach for this study regarding the underpinning ontology and epistemology.
- To determine the appropriate research strategy, including methods.
- To recruit residents, families and care staff.
- To analyse the data and identify themes within and across participant groups
- To report the findings in line with the Consolidated criteria for reporting qualitative research (COREQ) involving focus groups[131].

3.5 Summary and conclusions from Chapter 3

The research questions, aims, purposes and objectives for the complete thesis and the three component studies have been described. Chapters 4, 5 and 6 will report on each component study in detail, describing the methods, findings and conclusions, and Chapter 7 will integrate the findings from the three component studies and report on the final findings and conclusions.

Chapter 4: Diagnostic Accuracy Study

4.1 Contributions

The Diagnostic Accuracy Study described in this chapter was a distinct area of work embedded within a wider study which was conceived and developed by Dr Lee Hooper (LH). My contribution was to assess the diagnostic accuracy of individual clinical signs and symptoms. As a co-researcher, my contributions were to work with Dr Hooper to contribute to the ongoing development of the study. This included identifying which index tests to include, to develop the study's standard operating procedures, to recruit and interview care home managers and residents to participate in the study, independently conduct the analyses relating to the diagnostic accuracy of each individual clinical test selected and discuss the strengths and limitations of this work. Under supervision from Dr Hooper, I have reported on this study and its findings and written this chapter.

4.2 Aim and introduction to Chapter 4

To investigate the diagnostic accuracy of commonly-used clinical signs and symptoms ('index tests') of water-loss dehydration when compared to a robust reference standard (serum osmolality) to determine their utility for screening by care home staff working with older people.

4.3 Background

Screening tests for water-loss dehydration would aid care staff to identify residents who are dehydrated.

4.3.1 Screening for water-loss dehydration in older people

In water-loss dehydration, screening tests are based on the assumption that people who are, or who are becoming, dehydrated will exhibit signs and symptoms which are recognisable. As water-loss dehydration is generally considered to be a preventable condition, screening tests identifying possible dehydration are used to initiate further diagnostic testing and corrective strategies to improve hydration. In care homes, the CQC guidelines require that there are strategies in place to monitor residents at risk of dehydration, although they do not specify how this should be done[13]. Due to this requirement, many care home staff use clinical signs and symptoms as part of their care to monitor hydration status in residents.

These tests include observations of the oral mucous membranes for dryness, dryness of the skin and loss of elasticity, hypotonia of the ocular globes, rapid pulse and/or low blood pressure, increasing confusion, lethargy, agitation, fever and altered urinary indices (low volume, high specific gravity, dark colour).

Tests such as these are often used because they are believed to identify dehydration effectively and instantly, carers can conduct most of the tests without a nursing or medical directive, they can be undertaken with minimal equipment or training and they are acceptable to residents.

The purpose of this study is to investigate the validity of commonly used signs and symptoms of water-loss dehydration in older people living in care homes against the reference standard of serum osmolality.

4.3.2 Serum osmolality as the reference standard

In water-loss dehydration the reference standard is serum or plasma osmolality because it directly measures the concentration of serum or plasma, can be measured at a single assessment, is associated with health outcomes and is not affected by failing renal function[1,6,28,132,133].

The other advantage of using serum and plasma osmolality is that there is minimal variation within and between individuals (intra- and inter-individual variation) and the ratio of intraindividual (CVi) to interindividual variation (CVg), the index of individuality, for plasma osmolality ranges from 0.9-1.4 (a low index of individuality of <0.6 would indicate that individual fluctuations would go unnoticed relative to a larger population of individuals, whereas a high index of individuality of >1.4 would indicate that atypical individual values would be captured). The probability of identifying an atypical value increases as the ratio exceeds 0.6 and approaches 1.0, thus the index of individuality for plasma osmolality of between 0.9-1.4 (the equivalent in variation of 2-4mOsm/kg) indicates that there is little intraindividual variation, making it a more suitable measure for one-off assessments of dehydration[31,134,135].

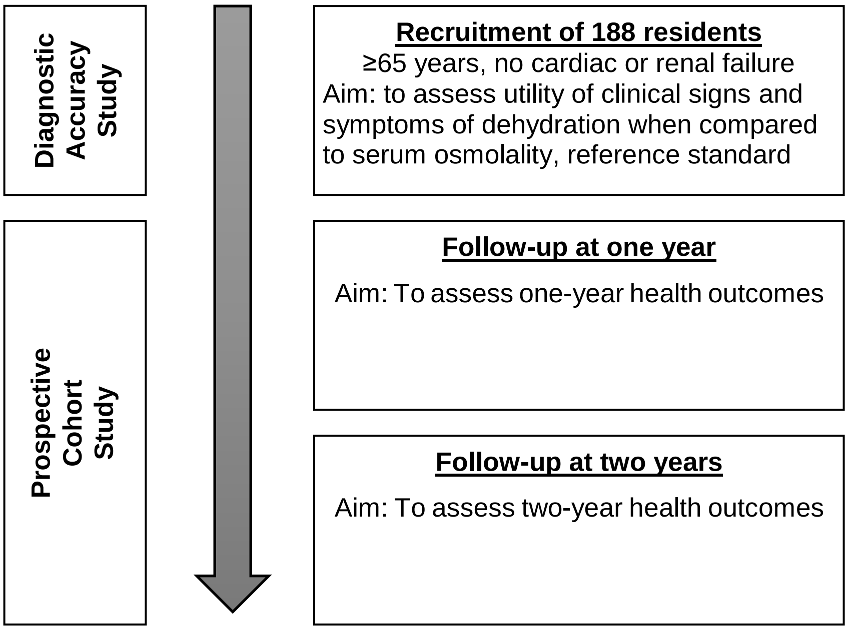
4.3.2.1 Disadvantages of using directly-measured serum osmolality as a routine screening test for water-loss dehydration in care homes

Whereas serum (and plasma) osmolality is a robust reference standard, and useful in a clinical setting, unfortunately it is not a good candidate as a screening tool in care homes because, as a blood test, it has to be specifically requested by a medical practitioner, venepuncture requires specialist phlebotomy skills, samples have to be analysed in specialist laboratories with specialist equipment and skilled laboratory technicians together with internal and external monitoring systems in place. Some laboratories (as was the case with our analytical facility) insist that samples should be tested within 5 hours which is a challenge in many rural communities, although this is not a requirement of all laboratories. Thus, if there is a concern about dehydration, the time required for care staff to raise their concerns with the resident's General Practitioner to order the test, arrange phlebotomy, delivery and analysis of samples and reporting back of results means that there is a considerable time delay. It is also costly. There are additional disadvantages to the resident, in that as it is an invasive test, it is associated with discomfort and possible bruising and infection (although minimal in both cases).

4.4 Study outline

The Dehydration Recognition In our Elders (DRIE) study was designed to be both a diagnostic accuracy study, a cross-sectional study to assess the utility of clinical signs of water-loss dehydration in older people, >65 years, living in care homes, when compared to the reference standard of serum osmolality, and a prospective cohort study investigating one and two-year health outcomes of participants (Figure 4-1). The cross-sectional data for the diagnostic accuracy of the clinical signs and symptoms are described in this thesis.

Figure 4-1: Design of the DRIE Study



The DRIE study was supported by a Steering Group and eight participant Advisory Groups. The role of the Steering Group was to provide advice, support and guidance to ensure delivery of the project outputs and thus its membership reflected the breadth and depth of knowledge required to do this and included academics, clinicians, stakeholders and members of the public (http://driestudy.appspot.com/researchers.html).

The role of the Advisory Groups was to provide insight into the conduct of the study from the perspectives of the care staff and residents and to provide advice and guidance for the research team on the interpretation of findings, methods of dissemination and future plans. During the three-year study, we had a total of four resident groups and four care staff groups (all located in participating care homes), although groups formed and disbanded depending on the availability of members.

Study registration**:** DRIE was registered with the Research Register for Social Care, www.researchregister.org.uk, in January 2012, number: 122273.

The study is reported conforming to the Standards for Reporting of Diagnostic Accuracy (STARD)[129], and the checklist is provided in Appendix 1.

4.5 Ethical considerations

DRIE was approved by the UK National Research Ethics Service Committee London–East Research Ethics committee (11/LO/1997) on 25/01/2012 (Appendix 2), and all study procedures were in accordance with the ethical standards of the Helsinki Declaration.

Ethical considerations relating to the involvement of care home residents in research are discussed in detail in Chapter 6, section 6.3.3.

4.6 Methods

The study aimed to recruit 200 care home residents, on the expectation that dehydration prevalence (current and/or impending) would be approximately 40% and should any clinical sign prove useful, then this would ensure a standard error of no more than 0.05 for Kappa values in excess of 0.75. Thus, the sample size would provide an estimate of diagnostic accuracy with a precision to allow an assessment of the practical utility of any potentially useful signs.

Recruitment took place between April 2012 and August 2013 from care homes in Norfolk and Suffolk, UK. Recruitment was a two-stage process, whereby care home managers were contacted in the first instance to gain permission for the study to take place within their care home and then residents were approached under the direction of the care home management to ensure that no-one was approached inappropriately.

4.6.1 Recruitment of care homes

Care homes were included if they provided residential, nursing and/or dementia care for people aged ≥65 years. Names of care homes were obtained from a dedicated publicly-accessible website (www.carehome.co.uk) using ‘Norfolk’ and ‘Suffolk’ as search terms. Care home managers were contacted in the first instance by letter, followed by a telephone call and face-to-face meeting. Each care home was allocated a unique study identification number.

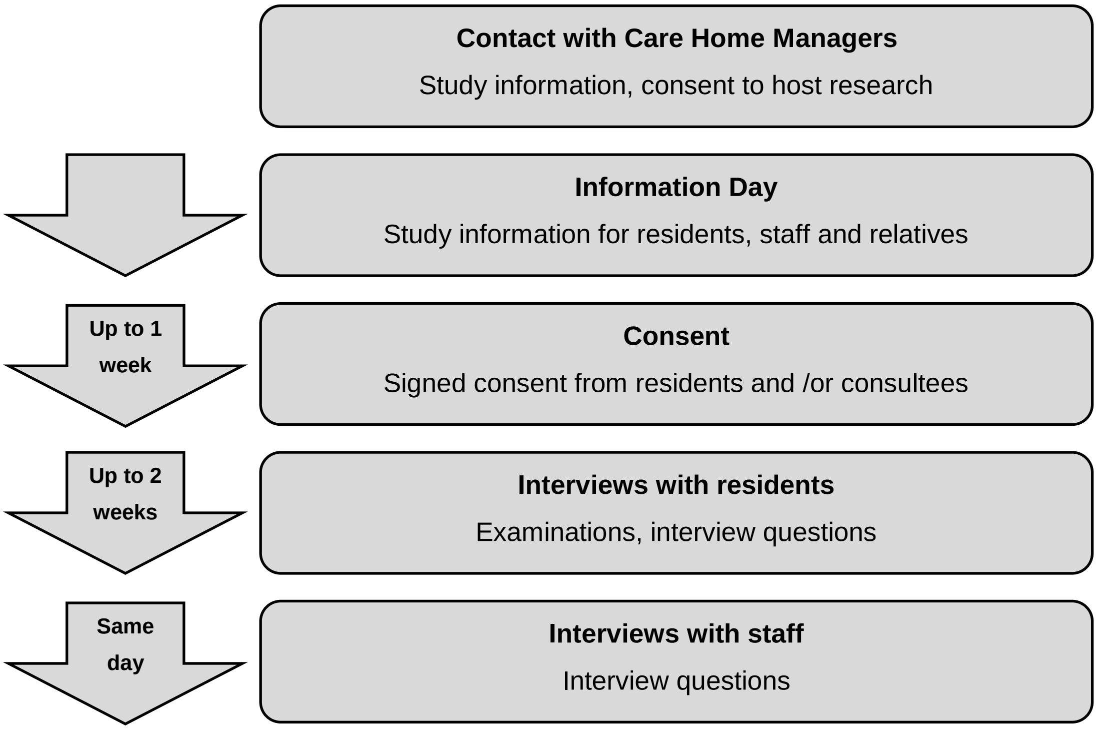
4.6.2 Recruitment of residents

Residents were eligible for inclusion if they were:

- Aged ≥65 years.
- Did ***not*** have cardiac or renal failure (requiring dialysis).
- Willing and able to provide written informed consent, or willing and consultee had provided a written declaration indicating that the resident would have chosen to take part if they still had the capacity to do so.

We developed a stepped approach to recruiting residents to ensure that they had time to think about the study and discuss it with those around them (Figure 4-2). In advance of the study commencing, posters were displayed around the home, participant information sheets (Appendix 3) distributed to all staff, residents and their family members and meetings arranged with the researchers. Residents who were interested in taking part were assessed by DB or LH to ascertain their capacity to provide written consent. Using procedures developed and approved by the National Research Ethics Service[136], capacity to provide consent was assessed by asking the resident three direct questions which required descriptive answers to determine understanding regarding the study and a further two questions requiring yes/no answers (Appendix 4). If these were answered appropriately, written consent from the resident was obtained (Appendix 5). If the resident was unable to answer any *one* question, verbal permission was requested from the resident to contact their consultee (usually a relative). If permission was obtained, a letter was sent to their consultee via the care home. The letter requested a written and signed declaration that the resident would have agreed to take part in the research if they had the capacity to do so (Appendix 6).

Figure 4-2: Stepped approach to recruitment



Following consent, researchers returned within two weeks to interview participants and to undertake the physical assessments using a standardised proforma developed for this study (Appendix 7). As consent is an on-going process, verbal consent was obtained immediately prior to the interview and before conducting any tests, enabling participants to withdraw from the study at any point during the interview. For those participants who withdrew consent prior to venepuncture (or venepuncture was unsuccessful), then their involvement was terminated at that point. However, if venepuncture was successful, then participation continued until either the interview was completed or they withdrew consent, but all data collected up to that point was included in the analyses.

Background information on the participant was provided by care home staff.

4.6.3 Interviews with residents

All interviews were conducted by DB or LH in each resident's own care home and in a place chosen by them, usually their own room. Residents could choose whether to be accompanied by a member of staff, relative or friend. Interviews were arranged at a mutually agreeable time, but all took place between 8.00am–8.00pm, lasted approximately 75 minutes and included the following:

1. Questions to obtain demographic information (name, date of birth, ethnicity, marital status, own and partner's [if applicable] employment)
2. Current health assessment
3. Venepuncture
4. Mouth examination
5. Eye examination
6. Skin examination
7. Skin turgor assessments
8. Finger capillary refill
9. Foot vein filling
10. Vital signs
11. Height and weight
12. Assessment of cognition (mini mental state examination, MMSE[137])
13. Urinalysis
14. Test of visual acuity
15. Questions about sleeping, drinking and toilet habits

Information from Questions 1-13 directly related to diagnostic accuracy and was analysed in this thesis. All data were recorded on paper forms, and participants were allocated a unique 4-digit randomised number.

4.6.4 Clinical signs and symptoms, ‘index tests’

The selection of which tests to include in the DRIE study was discussed by DB and LH and was informed by four relevant systematic reviews[33,91,95,138], two extensive reviews[88,93] as well as other published papers which had described and investigated clinical indices[77,139–141]. During the course of the study some additional tests were included when either residents or staff described using an examination which had not been previously mentioned (skin crimpling and dimpling). The 56 index tests used in the DRIE Study are listed in Table 4-1.

Full descriptions of how these clinical examinations were undertaken are described in the study’s Standard Operating Procedures and are briefly described in Table 4-1. Where examinations were fully described by the originating authors, or there were local policies, then these procedures were followed. However, for the majority of tests detailed descriptions of the procedures were not described and so specific procedures for conducting these examinations were developed by DB and LH. We trained together to standardise procedures and on-going standardisation occurred at regular intervals during the study. Any differences were noted and corrected and levels of agreement calculated, using kappas for categorical variables and intraclass correlation coefficients (ICC) for continuous variables.

All physical examinations were conducted within two hours of venepuncture and researchers were blinded to the results of the reference standard (serum osmolality) at the time of the interview and examinations. Following completion of the interview, all test results of clinical examinations (blood results, blood pressure, temperature, urinalysis) were reported back to the care home management and the resident’s General Practitioner (GP) with resident’s (or their consultee’s) consent.

Table 4-1: Clinical signs and symptoms, ‘index tests’, used in the DRIE Study

	Clinical test	n	Reasons for missing data	Recording of test results	Method of assessment
Mouth examination	1. Asking resident: Does your tongue feel dry at the moment?	186	Resident unable to answer	Very dry / slightly dry / moist	Resident’s judgement
	2. Tongue, visual assessment	139	Test introduced later in the study (23/8/12)	Very dry / slightly dry/ moist	Researcher’s judgement
	3. Tongue, stickiness with wooden tongue depressor	138	Test introduced later in the study (23/8/12)	Strongly / slightly / not sticky	Researcher’s judgement
	4. Tongue, surface dry to touch	183	Resident refused or no reason given	Very dry / slightly dry/ moist	Researcher’s judgement
	5. Tongue surface coated:	184	Resident refused or no reason given	No / slightly coated / very coated	Researcher’s judgement
	6. Tongue surface furrowed:	184	Resident refused or no reason given	Very furrowed / slightly furrowed / not furrowed	Researcher’s judgement
	7. Tongue furrowed sideways:	179	Resident refused or no reason given	Yes / slightly / No	Researcher’s judgement
	8. Tongue scalloped around edge:	97	Test introduced later in the study (3/1/13)	Yes / slightly / No	Researcher’s judgement
	9. Inside cheek, visual assessment:	182	Resident refused or no reason given	Very dry / slightly dry/ moist	Researcher’s judgement
	10. Inside cheek, stickiness with wooden tongue depressor	184	Resident refused or no reason given	Strongly / slightly / not sticky	Researcher’s judgement
	11. Inside cheek, dry to touch	183	Resident refused or no reason given	Very dry / slightly dry / moist	Researcher’s judgement
	12. Saliva under tongue in oral vestibule	181	Resident refused or no reason given	Saliva present (plenty) / some saliva / no saliva	Researcher’s judgement

(continued on next page)

	Clinical test	n	Reasons for missing data	Recording of test results	Method of assessment
	13. Saliva consistency:	80	Test introduced later in the study (03/01/2013)	Watery / thick or ropy / absent	Researcher's judgement
	14. Does resident use dentures?	138	Test introduced later in the study (23/08/2012)	Yes / No. If yes: full set / partial set	Researcher's judgement
	15. Inside lower lip dry on paper initially	185	Resident refused or no reason given	Very dry / slightly dry / moist	Researcher's judgement
	16. Inside lower lip dry on paper at 30 secs	184	Resident refused or no reason given	Very dry / slightly dry / moist	Researcher's judgement
	17. Colour of lips (blueness)	187	Resident refused or no reason given	Very blue / slightly blue / not blue	Researcher's judgement
	18. Lip dryness	188		Very dry / slightly dry / normal / moist	Researcher's judgement
	19. Lips cracked or chapped	188		Very chapped / slightly chapped / not chapped	Researcher's judgement
Eye examination	20. Presence of tears / moisture in eyes?	187	Resident refused or no reason given	Dry / normal / teary	Researcher's judgement
	21. Sunken eyes?	188		Yes / No	Researcher's judgement
	22. Asking resident: Do your eyes feel gritty or dry at the moment?	185	Resident refused or no reason given	Yes / No	Resident's judgement
Skin examinations	23. Dry skin on cheek?	188		Yes / No	Researcher's judgement
	24. Palm (dominant hand) – to touch	182	Resident refused or no reason given	Dry / slightly damp / quite damp / wet	Researcher's judgement

(continued on next page)

	Clinical test	n	Reasons for missing data	Recording of test results	Method of assessment
	25. Dry skin on inner upper arm?	186	Resident refused or no reason given	Yes / No	Researcher’s judgement
	26. Axilla (underarm) – to touch:	184	Resident refused or no reason given	Dry / slightly damp / quite damp / wet	Researcher’s judgement
	27. Skin, inner forearm: (i) dimpling and (ii) crinkling	132 131	Test introduced later in the study (07/09/2012)	Not dimpled / slightly dimpled/ very dimpled Not crinkled / slightly crinkled/ very crinkled	Researcher’s judgement
	28. Skin, inner upper arm: (i) dimpling and (ii) crinkling,	120 124	Test introduced later in the study (07/09/2012)	Not dimpled / slightly dimpled/ very dimpled Not crinkled / slightly crinkled/ very crinkled	Researcher’s judgement
	29. Skin, base of neck: (i) dimpling and (ii) crinkling	127 123	Test introduced later in the study (07/09/2012)	Not dimpled / slightly dimpled/ very dimpled Not crinkled / slightly crinkled/ very crinkled	Researcher’s judgement
	30. Dry skin on calf?	171	Unable to access area due to tight clothing, bandages or reason not given	Yes / No	Researcher’s judgement
Skin turgor	31. Skin turgor, back-of-hand: (i) vertical and (ii) horizontal plane	187 183	Resident refused or no reason given	(i) ______ seconds, parallel to fingers (ii) ______ seconds, 45º angle	Researcher’s judgement, & stopwatch used for timings
	32. Skin turgor, inside forearm: (i)vertical and (ii) horizontal plane	92 92	Test introduced later in the study (03/01/2013)	(i) ______ seconds (vertical plane, along arm), (ii) ______ seconds (horizontal, across arm)	Researcher’s judgement, & stopwatch used for timings
	33. Skin turgor, sternum: (i) vertical and (ii) horizontal plane	92 92	Test introduced later in the study (03/01/2013)	(i) ______ seconds (vertical plane, along sternum) (ii) ______ seconds (horizontal, across sternum)	Researcher’s judgement, & stopwatch used for timings
	34. Skin turgor, forefoot: (i) parallel to toes and (ii) 45º angle	141 137	Resident refused, unable to access foot, foot oedematous or reason not given	(i) ______ seconds, parallel to toes (ii) ______ seconds, 45º angle	Researcher’s judgement, & stopwatch used for timings
	35. Capillary refill, nail: (i) test 1 and (ii) test 2	171 167	Resident refused or wearing nail varnish	(i) ______ seconds (ii) ______ seconds	Researcher’s judgement, & stopwatch used for timings

(continued on next page)

	Clinical test	n	Reasons for missing data	Recording of test results	Method of assessment
Finger capillary fill, foot vein fill	36. Capillary refill, nail bed: (i) test 1 and (ii) test 2	181 181	Resident refused or no reason given	(i) ______ seconds (ii) ______ seconds	Researcher's judgement, & stopwatch used for timings
	37. Foot vein filling time: (i) vein 1, and (ii) vein 2	137 101	Resident refused, unable to access foot, foot oedematous or reason not given	(i) ______ seconds (ii) ______ seconds	Researcher's judgement, & stopwatch used for timings
Vital signs	38. Temperature	180	Resident refused, wearing hearing aids in both ears or reason not given	______ºC	Braun Thermoscan, model IR4520 (outer ear thermometer)
	39. Pulse	As for BP	*No baseline reading (6):* Resident declined interview prior to BP (2); 'Error' reading, despite repeated attempts (1); Measurement found to be painful, so not done (3); *No 1 minute reading (70):* Resident declined interview prior to baseline or 1 min BP (3); 'Error' reading (13); BP measure found to be painful, so not done (13); unable or difficult to stand (41) *No 3 minute reading (83):* Resident declined interview prior to baseline or 3 min BP (3); 'Error' reading (10); BP measure found to be painful, so not done (13); unable or difficult to stand (57)	Baseline, beats per minute: _________ At 1 minute after standing: _________ At 3 minutes after standing: _________	Omron M3 Large/medium/small cuffs used as appropriate depending on upper arm circumference. Large: 32-42cms Medium: 23-31cms Small: 17-22cms *(continued on next page)*
	40. BP (i) Baseline (ii) 1 minute after standing (iii) 3 minutes after standing	182 118 104		Blood pressure recorded as diastolic (DBP), systolic (SBP) and pulse pressure (PP, the difference between DBP & SBP), all in mmHg. Baseline, _______________________ At 1 minute after standing _________ At 3 minutes after standing _________	

	Clinical test	n	Reasons for missing data	Recording of test results	Method of assessment
Urinalysis	41. Volume	154	Volume not recorded (3)	_______________mls	Measuring cylinder, calibrated in mls
	42. Colour	157	Incontinence (10); contamination (1); inability to provide sample (6); refused (8); Carer not available to provide toileting assistance (1); no reason recorded (5)	1 2 3 4 5 6 7 8	Standardised colour pocket charts obtained from Human Hydration LLC (www.hydrationcheck.com). Urine decanted into a standard sized clear container held up in the light against a white background in natural light where possible.
	43. Cloudiness	157		Yes / slightly / no	Researcher's judgement
	44. USG by refractometer	157		1._________	Atago manual Master-URC/NM clinical refractometer, calibrated from 1.000 to 1.050 in units of 0.001, read by eye and calibrated with distilled water daily.
	45. USG by reagent strips	157		1.000 1.005 1.010 1.015 1.020 1.025 1.030	Siemens Multistik 8SG dip-stick equipment, read by eye in either natural light or artificial light. Stopwatch used for timings.
	46. Urine glucose by reagent strips, mmol/L:	157		Neg 5.5 (trace) 14 (+) 28 (++) 55 (+++) ≥111 (++++)	
	47. Urine ketones by reagent strips, mmol/L: :	157		Neg 0.5 (trace) 1.5(+) 4 (++) 8 (+++) ≥16 (++++)	
	48. Urine blood by reagent strips, ery/μL:	157		Neg 10 (trace) 80 (++) 10 (trace) 25 (+) 80 (++) 200 (+++)	*(continued on next page)*

	Clinical test	n	Reasons for missing data	Recording of test results	Method of assessment
	49. Urine pH by reagent strips:	157		5.0 6.0 6.5 7.0 7.5 8.0 8.5	
	50. Urine protein by reagent strips, g/L:	157		Neg trace 0.3 (+) 1 (++) 3 (+++) ≥20 (++++)	
	51. Urine nitrite by reagent strips:	157		Negative / Positive	
	52. Ur Leucocytes by reagent strips, leu/µL:	157		Neg 15 (trace) 70 (+) 125 (++) 500 (+++)	
Feelings	53. Feeling thirsty currently	185	Resident unable to answer	Yes / No	Resident’s judgement
	54. Feeling headachy currently	184	Resident unable to answer	Yes / No	Resident’s judgement
	55. Feeling ‘out of sorts’ currently	184	Resident unable to answer	Yes / No	Resident’s judgement
	56. Feeling tired currently	187	Resident unable to answer	Yes / No	Resident’s judgement

4.6.5 Serum osmolality, ‘reference standard’

Classification of hydration status was based on directly measured serum osmolality, obtained from a venous blood sample. Venepuncture was conducted by both DB and LH after completing an approved training course at the Norfolk and Norwich University Hospital, whose venepuncture procedures were adhered to for this study. A non-fasting venous blood sample was collected from an antecubital vein, or where necessary, from the back of the hand, after participants had rested for at least five minutes in a sitting (or occasionally lying) position. If a blood sample was not obtained after the second attempt the procedure was abandoned and participant excluded. Blood samples were collected using a needle and syringe, transferred to BD vacutainers® serum separation tubes (SST), using a dedicated transfer device and immediately inverted several times. Samples were stored in a temperature-controlled box (without heating or cooling, protected from outside temperature extremes) and delivered to the Department of Laboratory Medicine, Norfolk and Norwich University Hospitals Trust (Norfolk, UK) within four hours of collection. Samples were analysed on arrival. The laboratory is accredited with Clinical Pathology Accreditation (UK) Ltd., undertakes daily internal quality control and fortnightly external quality control. Using the ‘Advance Instruments Model 2020’, serum osmolality was directly measured using the depression of freezing point. This model has a repeatability of ±3mmol/kg (1 SD) in the 0-400mmol region. The laboratory reported that their coefficient of variance for analysis of serum osmolality (at all levels) was 0.9%. We tested this further by sending 19 duplicate blood samples for serum osmolality analysis to the same laboratory (samples were taken from the same blood draw, but transferred to separate tubes labelled with different sample numbers) to assess CV. The laboratory mean CV for these 19 duplicates was 0.6%.

Participants were categorised as being normally hydrated (directly measured serum osmolality 275- <295mOsm/kg), having impending dehydration (serum osmolality 295-300mOsm/kg), or current dehydration (>300mOsm/kg)[1,142]. Those with directly measured serum osmolality <275mOsm/kg were excluded in this analysis as this may have been indicative of conditions relating to an excess loss of electrolytes, such as undiagnosed hyponatremia or congestive heart failure.

4.6.6 Interviews with staff about participating residents

These took place the same day, or if this was not possible, the following day. Questions included:

- Current health and well-being.
- Barthel Index to assess function.
- Eating and drinking abilities.
- Medical history.
- Current medication use.
- Weight history over previous six months.
- Health professional contacts over the previous two months.

4.6.7 Interviews with staff about the care home itself

Care home managers were asked to provide some general, anonymised, information about the care home itself and residents currently residing there.

- Number of residents (currently and maximum capacity) and for each resident, anonymised data (age, sex, MUST score and length of time in residence).
- Type of care the home provided (residential, nursing and/or dementia).
- Number of residents diagnosed with dementia.
- Policies and practices about drinks provision, dehydration and its prevention.
- Staffing levels (number and grades of staff) at three timepoints (morning, afternoon, over-night).

4.6.8 Data management

On completion of the interview, all paper records were anonymised (where possible) and returned to the UEA for storage in locked filing cabinets in accordance with the UEAs data management policy[143]. Data were checked for completeness and entered into a database (Microsoft Access, 2010). Following data cleaning, data were transferred into a spreadsheet (Microsoft Excel, 2010) and statistical programme (Statistical Package for the Social Sciences, SPSS[144]) for analysis.

Data cleaning involved checking for errors in the data set, such as incorrect, incomplete or improperly formatted data. Any inconsistencies were checked against the raw data before amending the dataset, as appropriate.

4.6.9 Data analysis

In the first instance, the DRIE population was described, using descriptive statistics.

For the index tests, categorical variables were dichotomised for analysis. For example lips were assessed as: ‘very’ dry; ‘slightly’ dry, ‘normal’ or ‘moist’ and for analysis these were dichotomised as follows:

- ‘very’ dry ***vs*** ‘slightly’ dry/‘normal’/‘moist’
- ‘very’ dry/‘slightly’ dry ***vs*** ‘normal’/‘moist’
- ‘very’ dry/‘slightly’ dry/‘normal’ ***vs*** ‘moist’

Of the 56 index tests examined (Table 4-1), 36 were assessed as dichotomous variables (tests 1-30, 43, 51, 53-56). For each clinical sign and symptom, 2x2 tables were constructed in a Microsoft Excel spreadsheet[145] and the sensitivity and specificity, positive and negative predictive values (PPV and NPV respectively), positive and negative likelihood ratios, pre- and post-test probabilities and diagnostic odds ratios (DOR) were calculated at two cut-offs: 295-300mOsm/kg (impending dehydration) and >300mOsm/kg (current dehydration).

We were aiming to identify index tests with a sensitivity and specificity >70%, and positive and negative likelihood ratios of ≥2 and ≤0.5, respectively.

All remaining index tests were assessed as continuous variables. For each variable, the Shapiro-Wilk test was used to assess normality of distribution and the mean (SD) or median and IQR were calculated and reported for normally or non-normally distributed data, respectively. Where more than one reading was taken, the mean of the readings was also reported. The diagnostic accuracy of these index tests were analysed using Receiver Operating Curves (ROC) and Area Under the Curve (AUC) calculated using SPSS (Statistical Package for the Social Sciences[144]). We aimed for AUC >0.7, and if this occurred, then the best threshold or cut-off value for distinguishing between positive and negative test results would be assessed.

Positive and negative predictive values assessed the probability of dehydration being present or absent amongst those with positive or negative diagnostic test results, respectively (as these depend on the prevalence of dehydration). Whereas likelihood ratios indicate the odds of whether the positive or negative result is indeed positive or negative, respectively, given the prevalence of the condition in this population. Any index tests with positive likelihood ratio >2 or negative likelihood ratio <0.5 would indicate some discriminatory ability and so would be examined further.

The primary aim of data analysis was to ascertain the diagnostic accuracy of any individual clinical sign or symptom to identify residents with or without impending dehydration (serum osmolality 295-300mOsm/kg) as determined by the reference standard, serum osmolality (sOsm). The secondary aim was ascertainment of diagnostic accuracy of the same clinical signs and symptoms at a higher level of serum osmolality (>300mOsm/kg) indicates current dehydration.

4.6.10 Adverse events

There were no reported adverse events resulting from participation in this study, although it is possible that some participants may have experienced bruising around the venepuncture site, or developed an infection, both of which may have become apparent only following the interview, but this was not reported to the research team.

4.7 Results

4.7.1 Recruitment of care homes and residents

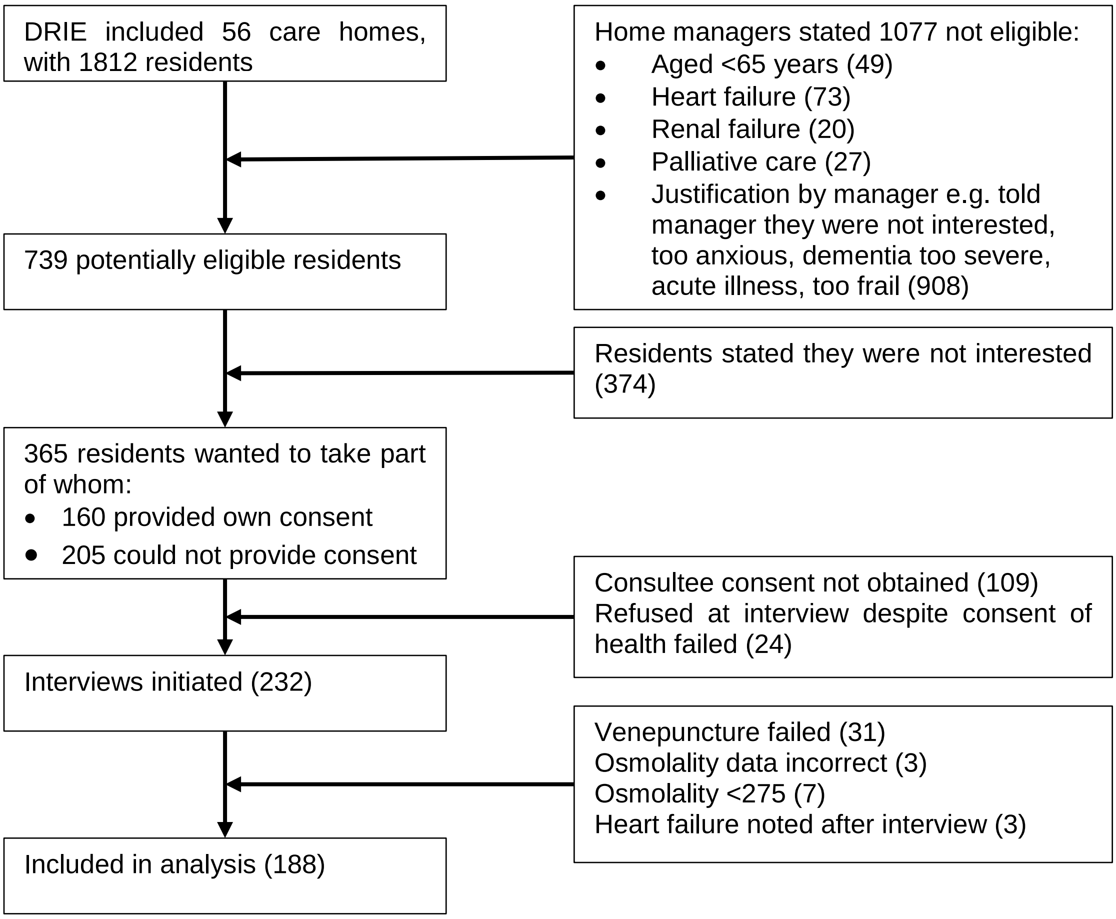
Of 148 care homes contacted, 67 agreed to participate, although in eleven of these care homes no residents participated (either all residents declined, or some consented but declined at interview, were unwell at interview, or venepuncture failed), leaving 56 care homes where at least one resident was included in the study.

The recruitment flow is shown in Figure 4-3. In the 56 participating care homes, housing 1812 residents, 188 (10.4%) participated in DRIE. 1077 (59%) were deemed ineligible by the care home managers due to young age (3%), cardiac or renal failure (5%), palliative care (2%), or just not interested, too ill, too anxious, too frail or dementia too severe (50%). Of the remaining 739 residents, a further 374 (21%) informed the researchers directly that they were not interested, leaving 365 (20%) who expressed an interest in taking part so their capacity for providing informed consent was assessed. 160 residents were able to provide their own informed consent, and the consultees of the remaining 205 residents were contacted. 96 (47% of those contacted) responded positively. With 256 consenting residents, we included 188 (24 declined or were too ill at interview, 3 were found to have cardiac failure following interview so had to be excluded, 7 had low serum osmolality indicating possible undiagnosed cardiac failure, 3 had unusable serum osmolality results due to laboratory error, venepuncture failed in 31).

The numbers of residents undergoing the index tests varied (Table 4-1). So, for example, 157 residents provided a sample for urinalysis, reasons for non-collection were: refusal (8), inability to provide sample despite trying (6), resident too incontinent to provide sample (10), sample contaminated with faeces (1), resident needed care staff help which was unavailable during the appropriate time window (1), no reason recorded (5).

We were unable to conduct the nail capillary refill test in 14 ladies, as they were wearing nail varnish, 51 residents had no foot examination due to the presence of oedema, bandaging, or difficulties removing footwear. Some tests were introduced later in the study, resulting in fewer participants undergoing the tests (tests 2, 3, 13, 14, 27-29, 32, 33).

Figure 4-3: Recruitment flow-chart for DRIE Study



4.7.2 Baseline characteristics of the DRIE population

The baseline characteristics of the total DRIE population are displayed in Table 4-2 together with those of the three sub-groupings (euhydrated, sOsm: 275-294mOsm/kg, n=98, 52%; impending dehydration, sOsm: 295-300mOsm/kg, n=52, 28%; current dehydration, sOsm: >300mOsm/kg, n=38, 20%). In the total DRIE population 124 (66%) were female, mean age 85.7 years (SD: 7.8) and median MMSE score: 23 (IQR: 18-26). The number of residents with MMSE score ≤23 (the generally accepted cut-off indicating cognitive impairment[146]) was 105 (54%) although the number of residents formally diagnosed with dementia was lower at 61 (32%) with a further 22 (12%) being described as having dementia by care staff. 130 (69%) residents had capacity to provide their own consent. The median Barthel Index score was 75 (IQR: 50-90) indicating some level of physical dependence; the mean body mass index (BMI) was 25.8 (SD: 5.6) and there were 34 (18%) diabetics.

In the currently dehydrated group there were a greater number of males and residents with diabetes and cognitive impairment (MMSE score $\leq$23 and dementia diagnosis), but there were no major differences between groups in age, Barthel Index score or BMI.

Table 4-2: Baseline characteristics of DRIE population

Characteristic	**Total DRIE Population n=188**	**Not dehydrated (serum osmolality 275-294 mOsm/kg) n=98 (52%)**	**Impending dehydration (serum osmolality 295-300 mOsm/kg) n=52 (28%)**	**Current dehydration (serum osmolality >300 mOsm/kg) n=38 (20%)**
Female, n (%)	124 (66)	72 (74)	30 (58)	22 (58)
Age, mean (SD, range)	86.7 (7.8, 65.0-105.0)	86.2 (7.5, 66.0-102.7)	85.3 (8.2, 65.8-105.5)	84.6 (8.0, 68.4-99.1)
Number of participants aged ≥85 years, n (%)	117 (62)	68 (69)	29 (56)	20 (53)
MMSE, median (range, IQR)	23 (0-30, 18-26), n=180	24 (0-30, 20-27), n=96	22 (10-30, 18-25), n=48	20 (8-29, 14-25), n=36
Number of participants with †MMSE ≥24, n (%)	83 (46), n=180	52 (54), n=96	19 (40), n=48	12 (33), n=36
Number, n (%), participants with: (i) reported dementia diagnosis (ii) staff suspect dementia, but not formally diagnosed	(i) 61 (32) (ii) 22 (12)	(i) 25 (26) (ii) 8 (8)	(i) 22 (42) (ii) 7 (14)	(i) 14 (37) (ii) 7 (18)
Own consent, n (%)	130 (69)	72 (74)	36 (69)	22 (58)
#Barthel Index, median (range, IQR)	75.0 (0-100, 50-90)	80.0 (5-100, 45-90)	75.0 (5-100, 51.25-88.75)	62.5 (0-95, 48.75-85)
Weight, kg, mean (SD, range)	69 (17, 39-123)	66 (15, 39-112)	69 (18, 41-116)	76 (20, 47-123)
BMI, mean (SD, range)	26 (6, 16-42)	25 (5, 16-39)	26 (6, 18-42)	27 (6, 17-42)
Diabetes, n (%)	34 (18)	10 (10)	10 (19)	14 (37)
Serum osmolality, mOsm/kg, mean (SD, range)	293 (8, 275-314)	287 (6, 275-294)	297 (2, 295-300)	304 (4, 301-314)

†*MMSE (range 0-30), interpretation of scores: ≥24 = no cognitive impairment; 18-23 = mild cognitive impairment; 0-17 = severe cognitive impairment*[146].
#*Barthel Index, range: 0-100. 0=total dependence, 100=total independence*[147].

4.7.3 Representativeness of the DRIE study population

To assess the representativeness of the DRIE study population, the DRIE cohort was compared with national statistics obtainable from the CQCs website[148]. Using these data, 400 care homes were listed as providing residential care for older people in Norfolk and Suffolk, and 10,359 in England as a whole. Of these, 285 (71%) homes in Norfolk and Suffolk (6,894, 67%, in England) were registered to provide residential care without nursing and 121 (30%) care with nursing (3,712, 36% in England). The number of care homes registered to provide dementia care was 241 (60%) in Norfolk and Suffolk and 6,180 (60%) in England. In the DRIE study, of the 56 residential care homes included, 39 (70%) provided residential care without nursing, 16 (29%) residential care with nursing and 34 (61%) were registered for dementia care, not substantially different from either Norfolk and Suffolk combined (where DRIE was based), or England as a whole (Table 4-3).

Table 4-3: Type of care provided by care homes in DRIE compared to those in Norfolk and Suffolk combined and England as a whole

	Filters used to calculate numbers *(columns are not mutually exclusive)*			
[†]Groupings	**Service user band**		**Service type: Care home service**	
	Older people *and* care home beds >1	**Dementia**	**Without nursing**	**With nursing**
	n	**n (%)**	**n (%)**	**n (%)**
DRIE	56	34 (61)	39 (70)	16 (29)
Norfolk & Suffolk	400	241 (60)	285 (71)	121 (30)
England	10,359	6,180 (60)	6,894 (67)	3,712 (36)

[†]*Grouping descriptions taken from the CQCs website*[148].

Of the UK population living in care homes, the Census data from 2011 states there were 'around' 2.8 women for each man aged 65 and over (in DRIE, 66% were female) and people aged 85 and over represented 59% of the older care home population (in DRIE this was 62%)[117].

The Department of Health estimates that approximately two thirds of care home residents are currently estimated to have dementia, although it is not clear how they have defined 'dementia' in this context[149]. In the DRIE study, 205 (56%) residents of the 365 that we approached did not have capacity to consent to the study and we obtained consultee agreement for 109 of these, although not everyone then went on to participate in DRIE. We completed the MMSE (a validated tool for assessing cognition in older people[137]) in 180 of the 188 residents who participated in DRIE and we found that 97

(54%) had scores of ≤23, indicating cognitive impairment as defined by Tombaugh[146]. In DRIE, we also asked care staff: ‘Does this resident have dementia?’, 61 (32%) residents were described as having a formal diagnosis, and a further 22 (12%) were described as having dementia by staff, although this had not been formally diagnosed.

4.7.3.1 DRIE participants who consented but venepuncture failed

31 residents failed to have a successful blood test, four of these declined whilst preparing for venepuncture, and in the remaining 27, venepuncture was unsuccessful. In this group, there were 22 (81%) females and mean age was 84 (SD: 9) years.

4.7.4 Diagnostic accuracy of the index tests

At the lower cut-off of 295-300mOsm/kg (indicating impending dehydration) none of the index tests investigated met the pre-determined criteria of sensitivity and specificity >70%, or AUC >0.7. These data are not presented in this thesis, but all the data for all the index tests analysed at the higher cut-off of >300mOsm/kg (indicating current dehydration) are presented and reported here.

4.7.5 Diagnostic accuracy of index tests analysed as categorical variables

The raw data, sensitivity and specificity are presented in Table 4-4. The remaining data (diagnostic odds ratio, positive and negative likelihood ratios, positive and negative predictive values, pre- and post-test probabilities) are presented in Appendix 8.

A number of tests demonstrated either sensitivity or specificity >70%, but no test demonstrated both.

Table 4-4: Sensitivity and specificity (95%CI) for each index test assessed dichotomously

	Index Test	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
1.1	Tongue feeling dry (resident) (V. Dry/Sl. Dry vs Moist)	7	36	30	113	0.19 (0.06, 0.32)	0.76 (0.69, 0.83)
1.2	Tongue feeling dry (resident) (V. Dry vs Sl. Dry/Moist)	2	11	35	138	0.05 (-0.02, 0.13)	0.93 (0.88, 0.97)
2.1	Mouth, visual inspection (V. Dry/Sl. Dry vs Moist)	10	50	16	63	0.38 (0.20, 0.57)	0.56 (0.47, 0.65)
2.2	Mouth, visual inspection (V. Dry vs Sl. Dry/Moist)	2	10	24	103	0.08 (-0.03, 0.18)	0.91 (0.86, 0.96)
3.1	Mouth, tongue depressor (Strongly/Slightly vs Not Sticky)	11	61	15	51	0.42 (0.23, 0.61)	0.46 (0.36, 0.55)
3.2	Mouth, tongue depressor (Strongly vs Slightly/Not Sticky)	0	2	26	110	0.00 (0.00, 0.00)	0.98 (0.96, 1.01)
4.1	Mouth, touch (V. Dry/Sl. Dry vs Moist)	8	31	28	116	0.22 (0.09, 0.36)	0.79 (0.72, 0.86)
4.2	Mouth, touch (V. Dry vs Sl. Dry/Moist)	0	4	36	143	0.00 (0.00, 0.00)	0.97 (0.95, 1.00)
5.1	Mouth, tongue coated (V. Coated/Sl. Coated vs Not Coated)	17	78	20	69	0.46 (0.30, 0.62)	0.47 (0.39, 0.55)
5.2	Mouth, tongue coated (V. Coated vs Sl. Coated/Not Coated)	6	18	31	129	0.16 (0.04, 0.28)	0.88 (0.82, 0.93)
6.1	Mouth, tongue furrows (V. Furrowed/Sl. Furrowed vs Not Furrowed)	15	63	22	84	0.41 (0.25, 0.56)	0.57 (0.49, 0.65)
6.2	Mouth, tongue furrows (V. Furrowed vs Sl. Furrowed/Not Furrowed)	3	15	34	132	0.08 (-0.01, 0.17)	0.90 (0.85, 0.95)
7.1	Mouth, tongue scalloped (Yes/Slightly vs Not Scalloped)	15	54	21	89	0.42 (0.26, 0.58)	0.62 (0.54, 0.70)
7.2	Mouth, tongue scalloped (Yes vs Slightly/Not Scalloped)	4	18	32	125	0.11 (0.01, 0.21)	0.87 (0.82, 0.93)
8.1	Mouth, scalloped edge (Yes/Slightly vs Not Scalloped)	2	10	17	68	0.11 (-0.03, 0.24)	0.87 (0.80, 0.95)
8.2	Mouth, scalloped edge (Yes vs Slightly/Not Scalloped)	0	1	19	77	0.00 (0.00, 0.00)	0.99 (0.96, 1.01)
9.1	Inside cheek, visual inspection (V. Dry/Sl. Dry vs Moist)	2	18	34	128	0.06 (-0.02, 0.13)	0.88 (0.82, 0.93)
9.2	Inside cheek, visual inspection (V. Dry vs Sl. Dry/Moist)	0	2	36	144	0.00 (0.00, 0.00)	0.99 (0.97, 1.01)
10.1	Inside cheek, tongue depressor (Strongly/Slightly vs Not Sticky)	14	61	22	87	0.39 (0.23, 0.55)	0.59 (0.51, 0.67)
10.2	Inside cheek, tongue depressor (Strongly vs Slightly/Not Sticky)	1	4	35	144	0.03 (-0.03, 0.08)	0.97 (0.95, 1.00)
11.1	Inside cheek, touch (V. Dry/Sl. Dry vs Moist)	10	41	26	106	0.28 (0.13, 0.42)	0.72 (0.65, 0.79)
11.2	Inside cheek, touch (V. Dry vs Sl. Dry/Moist)	1	1	35	146	0.03 (-0.03, 0.08)	0.99 (0.98, 1.01)
12.1	Mouth, saliva under tongue (None vs Some/Plenty)	3	17	33	128	0.08 (-0.01, 0.17)	0.88 (0.83, 0.94)
12.2	Mouth, saliva under tongue (None/Some vs Plenty)	27	119	9	26	0.75 (0.61, 0.89)	0.18 (0.12, 0.24)
13.1	Mouth, saliva consistency (Absent/Thick or Ropey vs Watery)	0	5	14	61	0.00 (0.00, 0.00)	0.92 (0.86, 0.99)
13.2	Mouth, saliva consistency (Absent vs Thick or Ropey/Watery)	0	2	14	64	0.00 (0.00, 0.00)	0.97 (0.93, 1.01)

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	Index Test	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
14.1	Dentures (resident) (Full/Partial vs None)	18	67	7	46	0.72 (0.54, 0.90)	0.41 (0.32, 0.50)
14.2	Dentures (resident) (Full vs Partial/None)	8	35	17	78	0.32 (0.14, 0.50)	0.69 (0.61, 0.78)
15.1	Lips, inside lip dry, 0 secs (V. Dry/Sl. Dry vs Moist)	13	75	24	73	0.35 (0.20, 0.51)	0.49 (0.41, 0.57)
15.2	Lips, inside lip dry, 0 secs (V. Dry vs Sl. Dry/Moist)	4	8	33	140	0.11 (0.01, 0.21)	0.95 (0.91, 0.98)
16.1	Lips, inside lip dry, 30 secs (V. Dry/Sl. Dry vs Moist)	18	88	19	59	0.49 (0.33, 0.65)	0.40 (0.32, 0.48)
16.2	Lips, inside lip dry, 30 secs (V. Dry vs Sl. Dry/Moist)	5	20	32	127	0.14 (0.02, 0.25)	0.86 (0.81, 0.92)
17.1	Blue lips (V.Blue/Sl. Blue vs Not Blue)	6	31	32	118	0.16 (0.04, 0.27)	0.79 (0.73, 0.86)
17.2	Blue lips (V.Blue vs Sl. Blue/Not Blue)	0	0	38	149	0.00 (0.00, 0.00)	1.00 (1.00, 1.00)
18.1	Lips dry (V. Dry/Sl. Dry vs Normal/Moist)	8	22	30	128	0.21 (0.08, 0.34)	0.85 (0.80, 0.91)
18.2	Lips dry (V. Dry/Sl. Dry/Normal vs Moist)	35	134	3	16	0.92 (0.84, 1.01)	0.11 (0.06, 0.16)
18.3	Lips dry (V. Dry vs Sl. Dry/Normal/Moist)	0	0	38	150	0.00 (0.00, 0.00)	1.00 (1.00, 1.00)
19.1	Lips cracked (V. Chapped/Sl. Chapped vs Not Chapped)	3	12	35	138	0.08 (-0.01, 0.16)	0.92 (0.88, 0.96)
19.2	Lips cracked (V. Chapped vs Sl. Chapped/Not Chapped)	0	0	38	150	0.00 (0.00, 0.00)	1.00 (1.00, 1.00)
20.1	Tears in eyes (Dry vs Normal/Teary)	0	1	38	148	0.00 (0.00, 0.00)	0.99 (0.98, 1.01)
20.2	Tears in eyes (Dry/Normal vs Teary)	33	135	5	14	0.87 (0.76, 0.98)	0.09 (0.05, 0.14)
21	Sunken eyes	7	35	31	115	0.18 (0.06, 0.31)	0.77 (0.70, 0.83)
22	Ask resident, do eyes feel gritty	3	23	34	125	0.08 (-0.01, 0.17)	0.84 (0.79, 0.90)
23	Dry skin on cheek	1	4	37	146	0.03 (-0.02, 0.08)	0.97 (0.95, 1.00)
24.1	Palm 3v1 (Wet/Q. Damp/Sl. Dry vs Dry)	30	115	7	30	0.81 (0.68, 0.94)	0.21 (0.14, 0.27)
24.2	Palm 2v2 (Wet/Q. Damp vs Sl. Dry/Dry)	37	144	0	1	1.00 (1.00, 1.00)	0.01 (-0.01, 0.02)
24.3	Palm 1v3 (Wet vs Q. Damp/Sl. Dry/Dry)	0	0	37	145	0.00 (0.00, 0.00)	1.00 (1.00, 1.00)
25	Dry skin, upper arm	3	22	34	127	0.08 (-0.01, 0.17)	0.85 (0.80, 0.91)
26.1	Axilla, 2v2 categories (Dry/Sl. Dry vs Q. Damp/Wet)	25	111	12	36	0.68 (0.52, 0.83)	0.24 (0.18, 0.31)
26.2	Axilla, 1v3 categories (Dry vs Sl. Damp/Q. Damp/Wet)	12	39	25	108	0.32 (0.17, 0.48)	0.73 (0.66, 0.81)
26.3	Axilla, 3v1 categories (Dry/Sl. Dry/Q. Damp vs Wet)	35	139	2	8	0.95 (0.87, 1.02)	0.05 (0.02, 0.09)
27.1	Forearm, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	11	49	13	59	0.46 (0.26, 0.66)	0.55 (0.45, 0.64)
27.2	Forearm, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	2	6	22	102	0.08 (-0.03, 0.19)	0.94 (0.90, 0.99)
27.3	Forearm, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	16	91	9	15	0.64 (0.45, 0.83)	0.14 (0.08, 0.21)

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	Index Test	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
27.4	Forearm, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	5	38	20	68	0.20 (0.04, 0.36)	0.64 (0.55, 0.73)
28.1	Upper arm, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	7	34	16	63	0.30 (0.12, 0.49)	0.65 (0.55, 0.74)
28.2	Upper arm, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	1	5	22	92	0.04 (-0.04, 0.13)	0.95 (0.90, 0.99)
28.3	Upper arm, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	9	68	14	33	0.39 (0.19, 0.59)	0.33 (0.24, 0.42)
28.4	Upper arm, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	2	20	21	81	0.09 (-0.03, 0.20)	0.80 (0.72, 0.88)
29.1	Neck, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	3	18	19	87	0.14 (-0.01, 0.28)	0.83 (0.76, 0.90)
29.2	Neck, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0	1	22	104	0.00 (0.00, 0.00)	0.99 (0.97, 1.01)
29.3	Neck, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	8	45	14	56	0.36 (0.16, 0.56)	0.55 (0.46, 0.65)
29.4	Neck, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	1	7	21	94	0.05 (-0.04, 0.13)	0.93 (0.88, 0.98)
30	Dry Skin, calf	9	53	24	85	0.27 (0.12, 0.42)	0.62 (0.53, 0.70)
34.1	Foot skin turgor, able to do test in either plane vs not able	15	32	23	118	0.39 (0.24, 0.55)	0.79 (0.72, 0.85)
37.1	Foot vein filling, able to do test vs not able to	15	36	23	114	0.39 (0.24, 0.55)	0.76 (0.69, 0.83)
41.1	Urinalysis, sample provided vs no sample	8	23	30	127	0.21 (0.08, 0.34)	0.85 (0.79, 0.90)
43.1	Urine, cloudy (Not Cloudy vs Partial Cloudy/Totally Cloudy)	9	43	21	84	0.30 (0.14, 0.46)	0.66 (0.58, 0.74)
43.2	Urine, cloudy (Not Cloudy/Partial Cloudy vs Totally Cloudy)	2	15	28	112	0.07 (-0.02, 0.16)	0.88 (0.83, 0.94)
51	Urinary nitrites	3	21	27	106	0.10 (-0.01, 0.21)	0.83 (0.77, 0.90)
53	Feeling thirsty currently	7	43	31	104	0.18 (0.06, 0.31)	0.71 (0.63, 0.78)
54	Feeling headachy currently	3	13	35	133	0.08 (-0.01, 0.16)	0.91 (0.86, 0.96)
55	Feeling ‘out of sorts’ currently	2	42	35	105	0.05 (-0.02, 0.13)	0.71 (0.64, 0.79)
56	Feeling tired currently	13	62	25	87	0.34 (0.19, 0.49)	0.58 (0.50, 0.66)

TP=true positive; FP=false positive; TN=true negative; FN=false negative

4.7.6 Diagnostic accuracy of index tests analysed as continuous variables

The tests undertaken, number of residents participating in each test and the mean or median readings are reported in Table 4-5, Table 4-6 and Table 4-7.

Blood pressure was taken following venepuncture and other clinical examinations to ensure residents were rested. Median time resting was 20 minutes (IQR: 20-30), with 170 (62%) residents having BP taken sitting with feet down, 11 (6%) sitting with feet up and 3 (2%) lying supine on their beds.

Urine samples were collected from 157 residents (section 4.7.1). The ability to provide a urine sample, compared to those who were unable to was analysed giving a sensitivity and specificity of 21% and 85% respectively (Table 4-4, test 41.1). Where a urine sample was provided, the median volume was 85mls (IQR: 40-155). Of the 8 colour categories, the median was ‘4’, with no participant having a reading of ‘8’. The median readings for urine specific gravity (USG) by refractometer and reagent strips were similar (1.013 and 1.015, respectively), and readings between the refractometer and reagent strips correlated well (r=0.7, p<0.001).

Nine participants were found to have a trace or more of glycosuria (trace = 2mmol/L) and eight of these were known diabetics. More participants were found to have either blood (37), protein (71), leucocytes (55) or nitrites (13) in their urine, and as any of these could be indicative of urinary tract infections (UTI), this information was relayed to both the care home manager and the GP, if consent was provided to do so.

To assess the diagnostic utility of the index tests assessed as continuous variables, ROC plots were constructed for each variable. These are displayed in Figures 4-4 – 4-46.

Table 4-5: Index tests assessed as continuous variables: skin assessments, capillary refill and foot vein filling

Test number	Index test	n	Normal distribution (Y/N)	Reading, seconds Median (IQR: 25th, 75th percentile)
31	Skin turgor on back of hand, seconds to return to normal:			
31.1	parallel to fingers	187	N	7 (4 to 11)
31.2	45º angle	183	N	8 (4 to11)
31.3	mean of the two readings	183	N	8 (4 to11)
32	Skin turgor on inside forearm, seconds to return to normal:			
32.1	vertical plane	92	N	2 (1 to 5)
32.2	horizontal plane	92	N	3 (1 to 8)
31.3	mean of the two readings	92	N	3 (1 to 7)
33	Skin turgor on sternum, seconds to return to normal:			
33.1	vertical plane	92	N	3 (1 to 11)
33.2	horizontal plane	92	N	2 (1 to 6)
33.3	mean of the two readings	92	N	3 (1 to 7)
34	Skin turgor on forefoot, seconds to return to normal:			
34.1	parallel to toes	141	N	2 (1 to 3)
34.2	45º angle	137	N	2 (0 to 4)
34.3	mean of the two readings	137	N	2 (1 to 4)
35	Capillary refill, nail, seconds to fill, mean of 2 readings	167	N	3 (2 to 4)
36	Capillary refill, nail-bed, seconds to fill, mean of 2 readings	181	N	4 (3 to 5)
37	Foot vein filling:			
37.1	vein 1, seconds to fill, mean of 2 readings	137	N	1 (0 to 1)
37.2	vein 2, seconds to fill, mean of 2 readings	101	N	0 (0 to 1)

Table 4-6: Index tests assessed as continuous variables: vital signs

Test number	Index test	n	Normal distribution (Y/N)	Reading, mean (SD) or median (IQR: 25th, 75th percentile)[†]
38	Temperature, °C	180	N	36.5 (36.2 to 36.8)
39	Pulse:			
39.1	1st reading, beats per minute (bpm), all residents	182	N	68 (60 to 77)
39.2	sitting, feet down	168	N	68 (59 to 76)
39.3	lying or sitting, feet up	14	Y	74 (12)
39.4	pulse, 1st reading, bpm, those able to stand subsequently	124	Y	68 (10)
39.5	pulse, 1st reading, bpm, *not* able to stand subsequently	58	N	68 (60 to 79)
39.6	pulse, 1 minute standing, bpm:	118	Y	77 (12)
39.7	pulse, 3 minute standing, bpm:	104	Y	77 (11)
39.8	pulse, difference baseline minus 1 minute, bpm:	118	N	-8 (-12 to -5)
39.9	pulse, difference baseline minus 3 minutes, bpm:	104	N	-8 (-11 to -4)
39.10	pulse, difference 1 minute minus 3 minutes, bpm:	98	N	0 (-2 to 2)
40	Diastolic blood pressure (DBP), mmHg:			
40.1	1st reading, mmHg, all residents	182	N	68 (62 to 75)
40.2	sitting, feet down	168	N	68 (61 to 75)
40.3	lying or sitting, feet up	14	Y	74 (11)
40.4	DBP, 1st reading, mmHg, those able to stand subsequently	124	N	68 (62 to 76)
40.5	DBP, 1st reading, mmHg, *not* able to stand subsequently	58	N	65 (60 to 74)
40.6	DBP, 1 minute standing, mmHg:	118	Y	74 (14)

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Test number	Index test	n	Normal distribution (Y/N)	Reading, mean (SD) or median (IQR: 25th, 75th percentile)†
40.7	DBP, 3 minute standing, mmHg:	104	Y	74 (13)
40.8	DBP, difference, baseline minus 1 minute, mmHg:	118	N	-3 (-8 to 2)
40.9	DBP, difference, baseline minus 3 minutes, mmHg:	104	Y	-4 (8)
40.10	DBP, difference 1 minute minus 3 minutes, mmHg:	98	N	-2 (-4 to 3)
	Systolic blood pressure (SBP), mmHg:			
40.11	1st reading, mmHg, all residents	182	N	133 (120 to 150)
40.12	sitting, feet down	168	N	132 (118 to 150)
40.13	lying or sitting, feet up	14	Y	143 (16)
40.14	SBP, 1st reading, mmHg, those able to stand subsequently	124	N	133 (121 to 153)
40.15	SBP, 1st reading, mmHg, *not* able to stand subsequently	58	N	131 (117 to 146)
40.16	SBP, 1 minute standing, mmHg:	118	Y	135 (26)
40.17	SBP, 3 minute standing, mmHg:	104	Y	140 (24)
40.18	SBP, difference, baseline minus 1 minute, mmHg:	118	Y	1 (18)
40.19	SBP, difference, baseline minus 3 minutes, mmHg:	104	N	-5 (-14 to 5)
40.20	SBP, difference, 1 minute minus 3 minutes, mmHg:	98	Y	-5 (11)
	Pulse pressure (PP), mmHg:			
40.21	1st reading, mmHg, all residents	182	N	64 (56 to 80)
40.22	sitting, feet down	168	N	64 (56 to 80)
40.23	lying or sitting, feet up	14	Y	69 (14)

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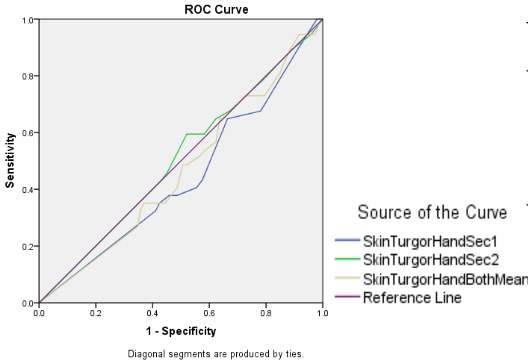
Test number	Index test	n	Normal distribution (Y/N)	Reading, mean (SD) or median (IQR: 25th, 75th percentile)†
40.24	PP, 1st reading, mmHg, those able to stand subsequently	124	Y	67 (18)
40.25	PP, 1st reading, mmHg, *not* able to stand subsequently	58	N	63 (52 to 81)
40.26	PP, 1 minute standing, mmHg:	118	N	60 (47 to 74)
40.27	PP, 3 minute standing, mmHg:	104	Y	66 (17)
40.28	PP, difference, baseline minus 1 minute, mmHg:	118	Y	5 (15)
40.29	PP, difference, baseline minus 3 minutes, mmHg:	104	Y	0 (14)
40.30	PP, difference, 1 minute minus 3 minutes, mmHg:	98	N	-3 (-11 to 3)

†mean (SD) reported for normally distributed data; median (IQR) reported for non-normally distributed data

Table 4-7: Index tests assessed as continuous variables: urinalysis

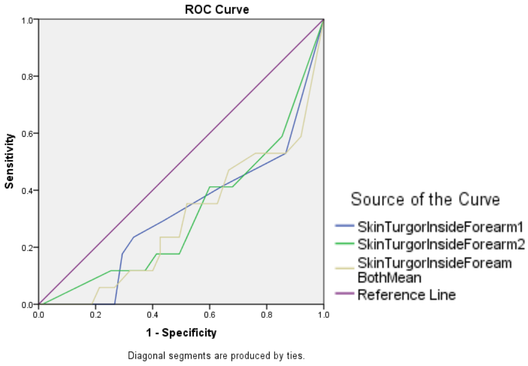
Test number	Index test	n	Normal distribution (Y/N)	Median (IQR: 25, 75 percentile)
41	Volume, mls	154	N	85 (40 to 155)
42	Colour, categories 1-8	157	N	4 (2, 5)
44	USG by refractometer, range 1.000-1.030	157	N	1.013 (1.009, 1.019)
45	USG by reagent strips, range 1.000-1.030	157	N	1.015 (1.010, 1.020)
46	Urine pH, range 5.0-8.5	157	N	6.0 (5.0, 6.0)
47	Urine glucose, mmol/L	157	N	Neg (Neg, Neg)
48	Urine ketones, mmol/L	157	N	Neg (Neg, Neg)
49	Urine blood, ery/µL	157	N	Neg (Neg, Neg)
50	Urine protein, g/L	157	N	Neg (Neg, trace)
52	Urine leucocytes, leu/µL	157	N	Neg (Neg, 70)

Figure 4-4: Test 31.3, skin turgor, back of hand



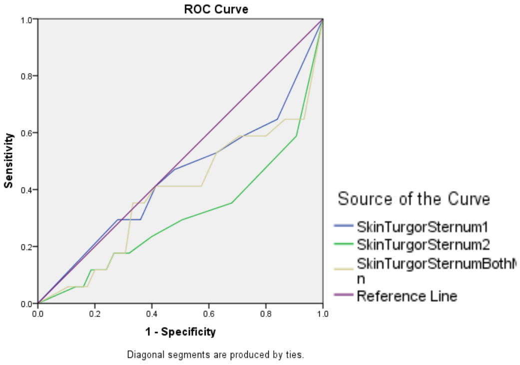
Test	AUC (95%CI)
(i) parallel to fingers	0.44 (0.34, 0.55)
(ii) 45^o angle	0.51 (0.40, 0.61)
(iii) mean of the two readings	0.47 (0.36, 0.57)

Figure 4-5: Test 32.3, skin turgor, inside forearm above wrist



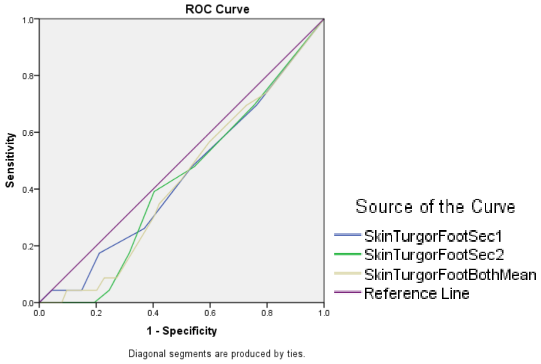
Test	AUC (95%CI)
(i) vertical	0.32 (0.17, 0.46)
(ii) horizontal	0.32 (0.17, 0.46)
(iii) mean of the two readings	0.30 (0.16, 0.43)

Figure 4-6: Test 33.3, skin turgor, sternum



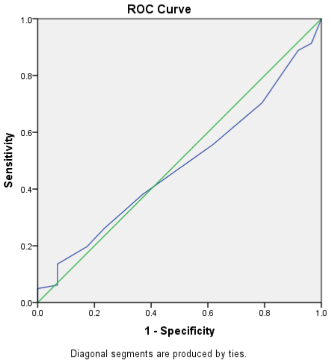
Test	AUC (95%CI)
(i) vertical	0.44 (0.28, 0.61)
(ii) horizontal	0.31 (0.16, 0.46)
(iii) mean of the two readings	0.39 (0.23, 0.55)

Figure 4-7: Test 34.3, skin turgor, forefoot



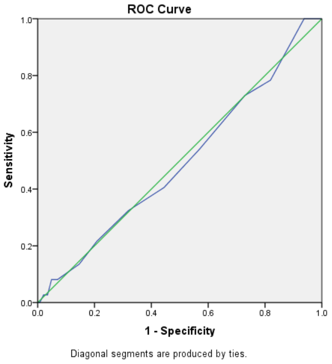
Test	AUC (95%CI)
(i) parallel to toes	0.44 (0.32, 0.57)
(ii) 45^o angle	0.43 (0.31, 0.54)
(iii) mean of the two readings	0.43 (0.31, 0.55)

Figure 4-8: Test 35, capillary refill, nail



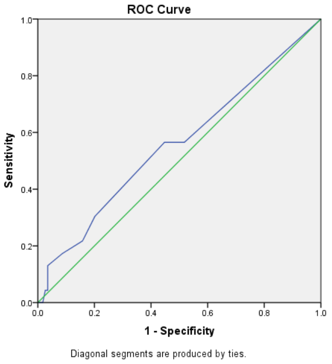
Test	AUC (95%CI)
Capillary refill, nail mean of two readings	0.45 (0.32, 0.57)

Figure 4-9: Test 36, capillary refill, nail-bed



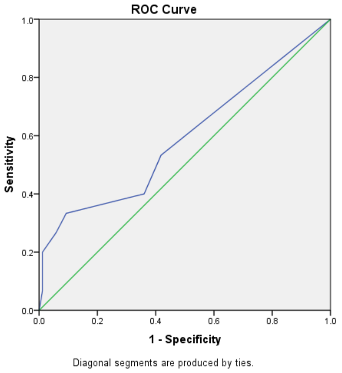
Test	AUC (95%CI)
Capillary refill, nail-bed mean of two readings	0.50 (0.39, 0.60)

Figure 4-10: Test 37.1, foot vein filling, vein 1



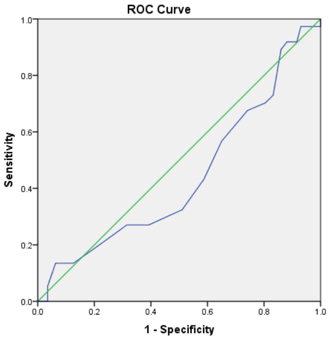
Test	AUC (95%CI)
Foot vein filling, vein 1, mean of the two readings	0.56 (0.42, 0.69)

Figure 4-11: Test 37.2, foot vein filling, vein 2



Test	AUC (95%CI)
Foot vein filling, vein 2, mean of the two readings	0.59 (0.42, 0.77)

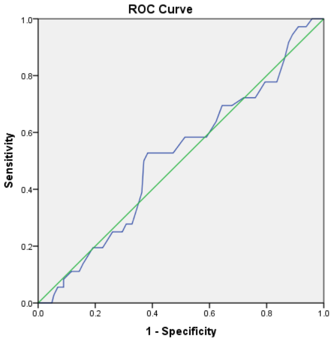
Figure 4-12: Test 38, temperature



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Temperature	0.44 (0.34, 0.55)

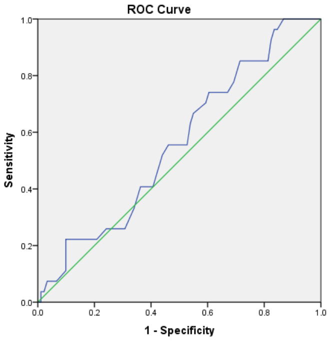
Figure 4-13: Test 39.1, pulse rate, resting



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse rate, resting	0.51 (0.41, 0.62)

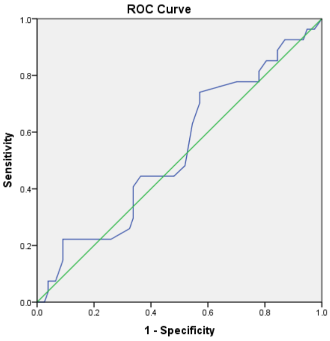
Figure 4-14: Test 39.6, pulse rate, 1 minute after standing



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse rate, 1 minute after standing	0.56 (0.44, 0.68)

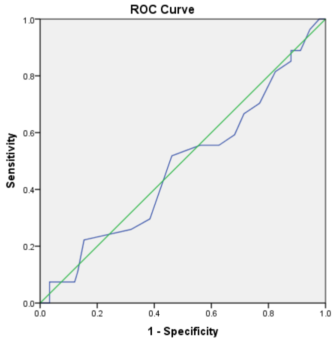
Figure 4-15: Test 39.7, pulse rate, 3 minutes after standing



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse rate, 3 minutes after standing	0.54 (0.41, 0.66)

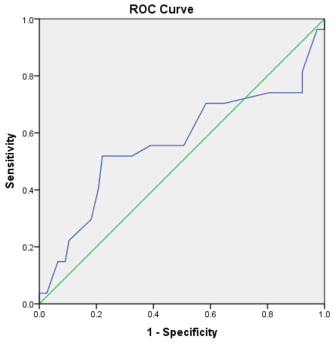
Figure 4-16: Test 39.8, pulse rate, difference resting-1 minute



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse rate, difference resting-1 minute	0.48 (0.36, 0.61)

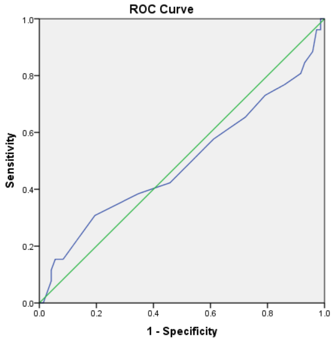
Figure 4-17: Test 39.9, pulse rate, difference resting-3 minutes



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse rate, difference resting-3 minutes	0.57 (0.42, 0.71)

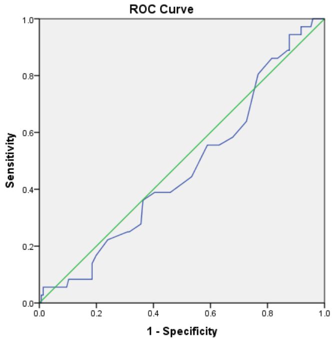
Figure 4-18: Test 39.10, pulse rate, difference 1-3 minutes



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse rate, difference 1 minute-3 minutes standing	0.50 (0.35, 0.64)

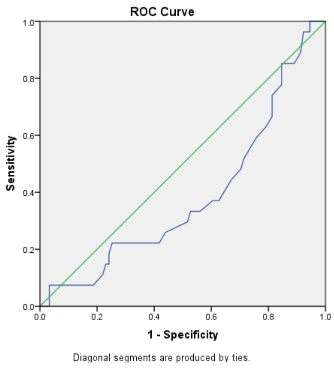
Figure 4-19: Test 40.1, DBP, resting



Diagonal segments are produced by ties.

Test	AUC (95%CI)
DBP, resting	0.47 (0.37, 0.57)

Figure 4-20: Test 40.6, DBP, 1 minute after standing

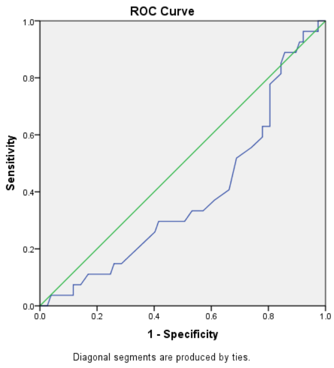


Diagonal segments are produced by ties.

Test	AUC (95%CI)
DBP, 1 minute after standing	0.39 (0.27, 0.51)

NB: AUC (95%CI) are the same for both tests 40.6 and 40.7

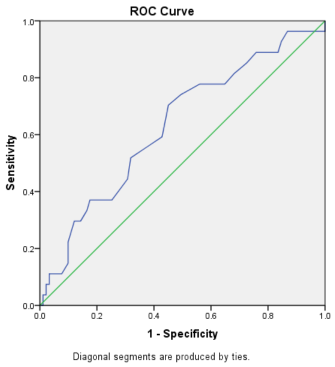
Figure 4-21: Test 40.7, DBP, 3 minutes after standing



Diagonal segments are produced by ties.

Test	AUC (95%CI)
DBP, 3 minute after standing	0.39 (0.27, 0.51)

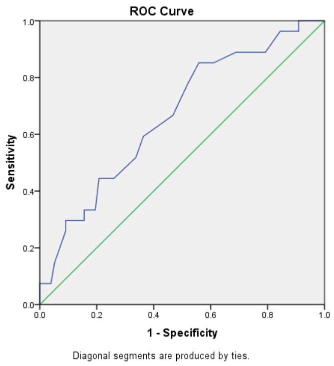
Figure 4-22: Test 40.8, DBP, difference resting-1 minute



Diagonal segments are produced by ties.

Test	AUC (95%CI)
DBP, difference resting-1 minute	0.63 (0.51, 0.75)

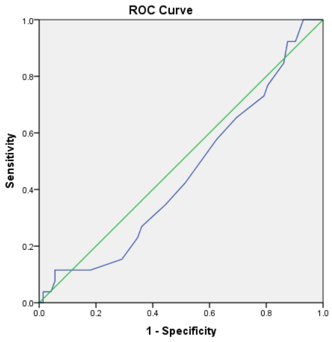
Figure 4-23: Test 40.9, DBP, difference resting-3 minutes



Diagonal segments are produced by ties.

Test	AUC (95%CI)
DBP, difference resting-3 minutes	0.67 (0.55, 0.78)

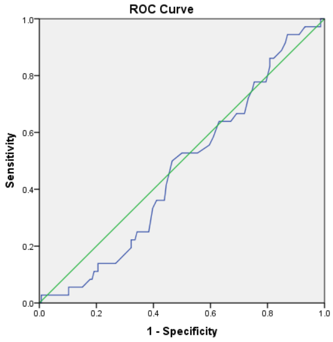
Figure 4-24: Test 40.10, DBP, difference 1-3 minutes



Diagonal segments are produced by ties.

Test	AUC (95%CI)
DBP, difference 1-3 minutes	0.45 (0.33, 0.58)

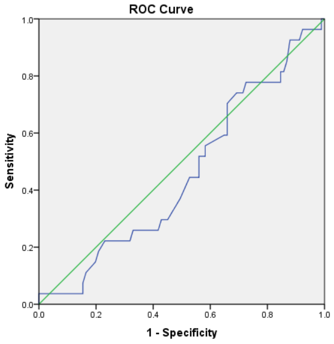
Figure 4-25: Test 40.11, SBP, resting



Diagonal segments are produced by ties.

Test	AUC (95%CI)
SBP, resting	0.47 (0.37, 0.57)

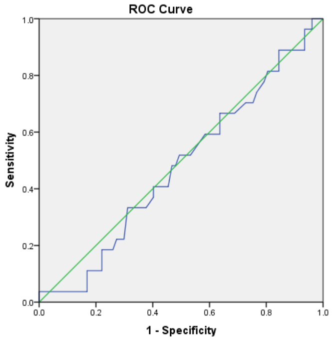
Figure 4-26: Test 40.16, SBP, 1 minute after standing



Diagonal segments are produced by ties.

Test	AUC (95%CI)
SBP, 1 minute after standing	0.46 (0.34, 0.58)

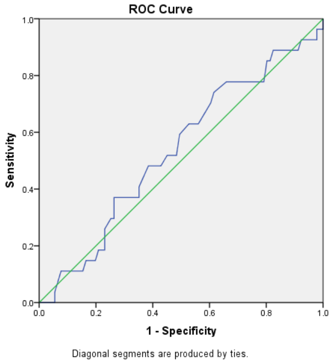
Figure 4-27: Test 40.17, SBP, 3 minute after standing



Diagonal segments are produced by ties.

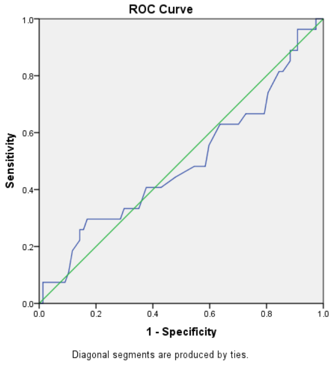
Test	AUC (95%CI)
SBP, 3 minute after standing	0.48 (0.35, 0.60)

Figure 4-28: Test 40.18, SBP, difference resting-1 minute



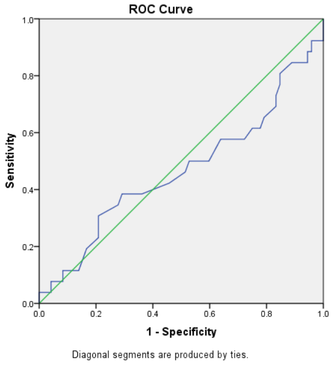
Test	AUC (95%CI)
SBP, difference resting-1 minute	0.54 (0.41, 0.66)

Figure 4-29: Test 40.19, SBP, difference resting-3 minutes



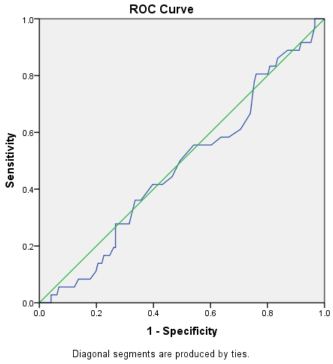
Test	AUC (95%CI)
SBP, difference resting-3 minutes	0.49 (0.36, 0.63)

Figure 4-30: Test 40.20, SBP, difference 1-3 minutes



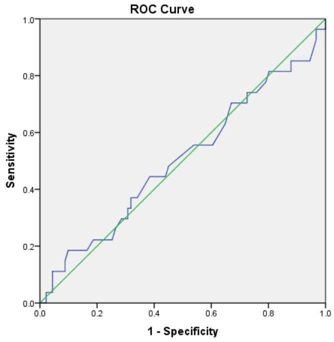
Test	AUC (95%CI)
SBP, difference 1-3 minutes	0.47 (0.33, 0.61)

Figure 4-31: Test 40.21, pulse pressure, resting



Test	AUC (95%CI)
Pulse pressure (PP), resting	0.48 (0.37, 0.58)

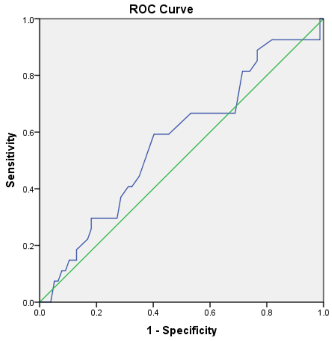
Figure 4-32: Test 40.26, pulse pressure, 1 minute standing



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse pressure (PP), 1 minute after standing	0.50 (0.37, 0.63)

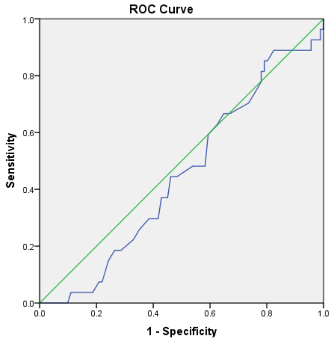
Figure 4-33: Test 40.27, pulse pressure, 3 minute standing



Diagonal segments are produced by ties.

Test	AUC (95%CI)
Pulse pressure (PP), 3 minute after standing	0.57 (0.44, 0.69)

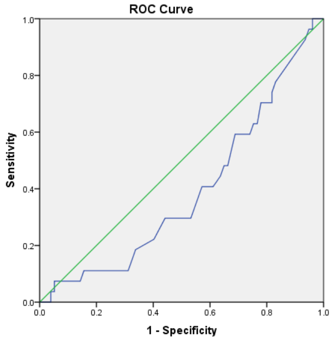
Figure 4-34: Test 40.28, pulse pressure, difference resting-1 minute



Diagonal segments are produced by ties.

Test	AUC (95%CI)
PP, difference resting-1 minute	0.45 (0.33, 0.57)

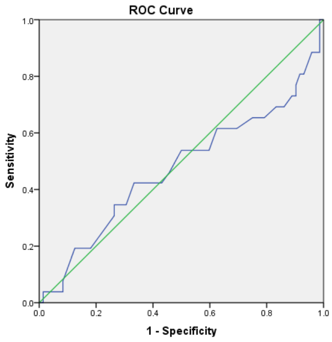
Figure 4-35: Test 40.29, pulse pressure, difference resting-3 minutes



Diagonal segments are produced by ties.

Test	AUC (95%CI)
PP, difference resting-3 minutes	0.39 (0.27, 0.51)

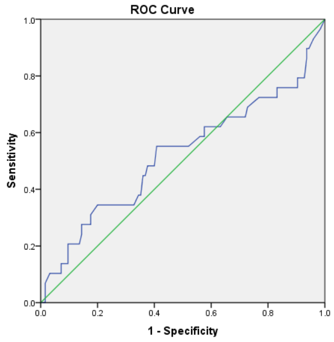
Figure 4-36: Test 40.30, pulse pressure, difference 1-3 minutes


ROC Curve

Diagonal segments are produced by ties.

Test	AUC (95%CI)
PP, difference 1-3 minutes	0.47 (0.33, 0.62)

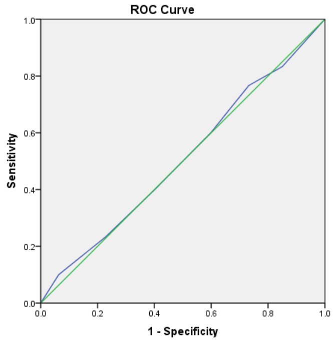
Figure 4-37: Test 41, urinary volume


ROC Curve

Diagonal segments are produced by ties.

Test	AUC (95%CI)
Urinary volume	0.52 (0.39, 0.65)

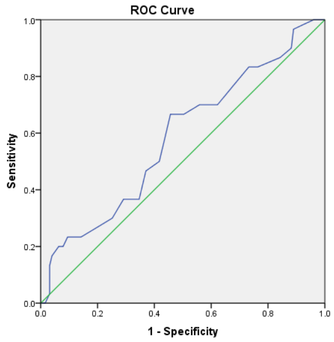
Figure 4-38: Test 42, urinary colour


ROC Curve

Diagonal segments are produced by ties.

Test	AUC (95%CI)
Urinary colour	0.51 (0.39, 0.62)

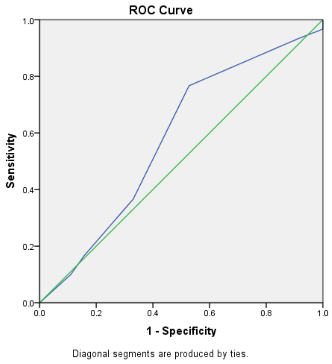
Figure 4-39: Test 44, USG by refractometer


ROC Curve

Diagonal segments are produced by ties.

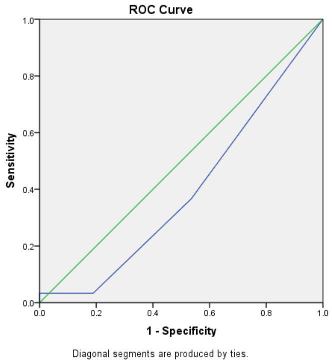
Test	AUC (95%CI)
USG by refractometer	0.58 (0.47, 0.70)

Figure 4-40: Test 45, USG by reagent strip



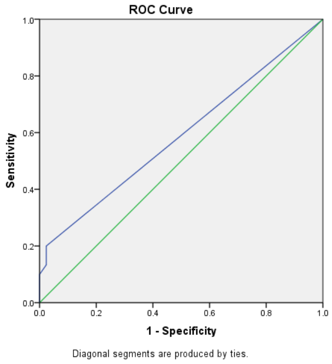
Test	AUC (95%CI)
USG by reagent strip	0.58 (0.47, 0.69)

Figure 4-41: Test 46, urinary pH



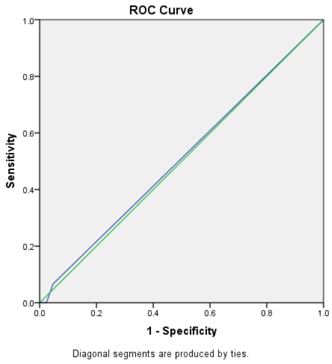
Test	AUC (95%CI)
Urinary pH	0.39 (0.29, 0.50)

Figure 4-42: Test 47, urinary glucose



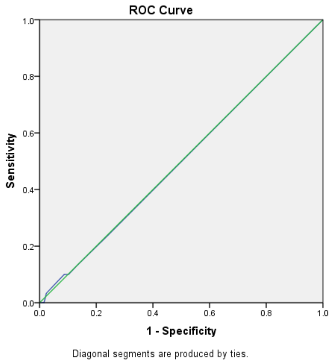
Test	AUC (95%CI)
Urinary glucose	0.59 (0.47, 0.71)

Figure 4-43: Test 48, urinary ketones



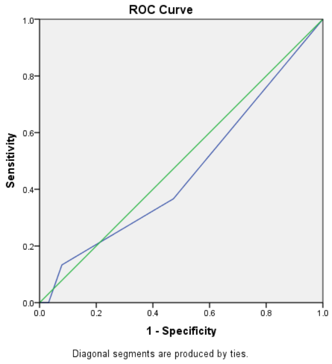
Test	AUC (95%CI)
Urinary ketones	0.51 (0.39, 0.63)

Figure 4-44: Test 49, urinary blood



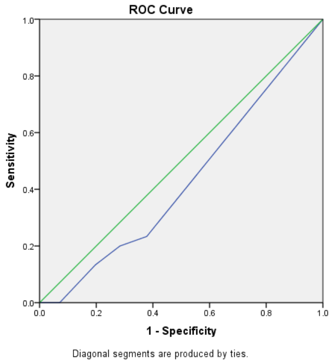
Test	AUC (95%CI)
Urinary blood	0.50 (0.38, 0.62)

Figure 4-45: Test 50, urinary protein



Test	AUC (95%CI)
Urinary protein	0.46 (0.34, 0.58)

Figure 4-46: Test 52, urinary leucocytes

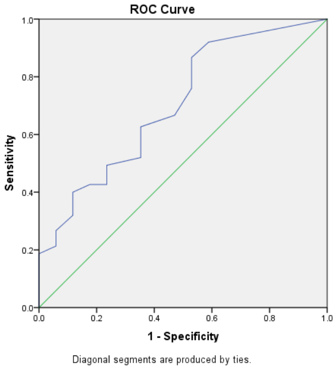


Test	AUC (95%CI)
Urinary leucocytes	0.43 (0.32, 0.54)

To have any utility as a screening test, AUC of >0.7 would be expected. None of the tests displayed in Figures 4-4 to 4-46 reach this criterion. The tests with the highest AUC were the differences in diastolic blood pressure (DBP) between baseline and 1 minute (test 40.8: AUC=0.63, 95%CI: 0.51, 0.75) and baseline and 3 minutes (test 40.9: AUC=0.67, 95%CI: 0.55, 0.78). One of the skin turgor tests (test 32.3: the mean of two readings taken on the forearm above the wrist) was found to have AUC=0.30. As this is a 'negative' reading, this was transposed to give an AUC=0.70 (95%CI: 0.57, 0.84) thus meeting our pre-set requirement of >0.7 and the potential for having some diagnostic utility, but in reverse, so the test becomes one of hydration, rather than dehydration

(Figure 4-47). However, on examining the cut-offs, there was no point at which both sensitivity and specificity were both >70% to be useful (Table 4-8).

Figure 4-47: Test 32.3, skin turgor, inside forearm



Test	AUC (95%CI)
Skin turgor, mean of two readings, transposed.	0.70 (0.57, 0.84)

Table 4-8: Test 32.3 (skin turgor inside forearm) sensitivity and specificity for each cut-off, when AUC transposed

Cut-off (seconds)	Sensitivity	Specificity
≥0.25	0.92	0.41
≥0.75	0.87	0.47
≥1.25	0.76	0.47
≥1.75	0.67	0.53
≥2.25	0.63	0.65
≥2.75	0.52	0.65
≥3.25	0.49	0.77
≥3.75	0.43	0.77
≥4.25	0.43	0.82
≥4.75	0.40	0.88
≥5.25	0.39	0.88
≥5.75	0.35	0.88
≥6.25	0.32	0.88
≥6.75	0.27	0.94
≥7.25	0.23	0.94
≥7.75	0.21	0.94
≥8.25	0.19	1.0
≥9.0	0.15	1.0
≥10.25	0.07	1.0

AUC for all other skin turgor sites, capillary refill, foot vein filling and urinalysis were all non-significant, with AUCs in the range 0.39-0.59.

The results of the interrater reliability assessments are reported in Table 4-9 (categorical variables) and Table 4-10 (continuous variables). Using the interpretations described by Viera and Garrett[150] for kappa, interrater agreement was considered to have occurred less than chance on 4 tests ($p>0.05$), there was slight agreement for 4 tests ($p>0.05$), fair agreement for 4 tests ($p=0.02$ for skin dimpling, but $p>0.05$ for remaining tests), moderate agreement on 7 tests ($p<0.05$ for USG, haematuria and coating of the tongue, but $p>0.5$ for remaining tests), substantial agreement on 3 tests ($p<0.05$ for all three tests), and almost perfect agreement on 3 tests ($p<0.05$ for all three tests)

Interestingly, the AUC for urine colour was 0.51 ($p=0.14$) so no better than chance and the agreement for kappa on urine colour was only 'slight' ($k=0.18$), and this is the test most often cited as being the most useful.

For the continuous variables, Cicchetti and Sparrow's[151] interpretation of the ICC were used, so skin turgor assessed on both the sternum and forearm (but not the back-of-the-hand or forefoot) were 'excellent', although only the forearm was significant ($p=0.02$). ICC for finger capillary refill was 'fair' ($p=0.07$) but foot vein filling was -0.44 ($p=0.81$).

Table 4-9: Interrater reliability of index tests assessed as categorical variables, using kappa

Test Number	Index test	n	Kappa (k)	P
2	Tongue, visual assessment	7	-0.12	0.68
3	Tongue, stickiness with wooden tongue depressor	7	0.46	0.15
4	Tongue, surface dry to touch	7	-0.52	0.15
5	Tongue surface coated:	8	0.44	0.03
6	Tongue surface furrowed:	8	0.62	0.01
7	Tongue furrowed sideways:	7	-0.08	0.77
8	Tongue scalloped around edge:	4	Not computable	
9	Inside cheek, visual assessment:	7	Not computable	
10	Inside cheek, stickiness with wooden tongue depressor	7	0.13	0.50
11	Inside cheek, dry to touch	7	0.22	0.35
12	Saliva under tongue in oral vestibule	7	0.19	0.45
11	Saliva consistency:	5	Not computable	
15, 16	Dryness of inside lower lip at 0 and 30 secs, two tests combined	14	-0.15	0.35
17	Colour of lips (blueness)	8	Not computable	
18	Lip dryness	8	Not computable	
19	Lips cracked or chapped	8	Not computable	
20	Presence of tears / moisture in eyes	7	1.00	0.01
21	Sunken eyes	7	Not computable	

(continued on next page)

Test Number	Index test	n	Kappa (k)	P
11, 25, 30	Dryness of skin on cheek, arm and calf, all tests combined	13	0.44	0.06
24, 26	Dampness of axilla and palm, tests combined	8	0.54	0.06
27(i) – 29(ii)	Dimpling of skin on arms (2 sites) and sternum, all tests combined	13	0.30	0.02
27(i) – 29 (ii)	Crinkling of skin on arms (2 sites) and sternum, all tests combined	13	0.17	0.36
42	Urine Colour	11	0.18	0.14
43	Urine Cloudiness	11	0.79	0.01
44	USG by refractometer	11	0.60	0.00
45	USG by reagent strips	11	0.49	0.01
46	Urine glucose by reagent strips, mmol/L:	11	1.00	0.00
47	Urine ketones by reagent strips, mmol/L: :	11	Not computable	
48	Urine blood by reagent strips, ery/µL:	11	0.54	0.00
49	Urine pH by reagent strips:	11	0.21	0.38
50	Urine protein by reagent strips, g/L:	11	0.37	0.10
51	Urine nitrite by reagent strips:	11	1.00	0.001
52	Urine leucocytes by reagent strips, leu/µL:	11	0.77	0.00

Interpretation of Kappa[150]:
< 0 Less than chance agreement
0.01–0.20 Slight agreement
0.21– 0.40 Fair agreement
0.41–0.60 Moderate agreement
0.61–0.80 Substantial agreement
0.81–0.99 Almost perfect agreement

Table 4-10: Interrater reliability of index tests assessed as continuous variables, using intraclass coefficient (ICC)

Test Number	**Index test**	**n**	**ICC (r, 95%CI)**	**P**
31	Skin turgor, back-of-hand, mean of two readings	5	0.35 (-0.64, 0.91)	0.25
32	Skin turgor, inside forearm, mean of two readings	5	0.82 (0.02, 0.98)	0.02
33	Skin turgor, sternum, mean of two readings	2	0.89 (-0.95, 1.0)	0.15
34	Skin turgor, forefoot, mean of two readings	2	0.00 (-1.0, +1.0)	0.5
35,36	Finger capillary refill, nail and nailbed combined	13	0.41 (-0.15, 0.78)	0.07
37	Foot vein filling time, readings from both veins combined	5	-0.44 (-0.92, 0.58)	0.81

Interpretation of ICC[151]:
<0.4=poor
0.40-0.59=fair
0.60-0.74=good
>0.74=excellent

4.8 Discussion

4.8.1 Statement of principal findings

This was an empirical diagnostic accuracy study set in 56 care homes in Norfolk and Suffolk, recruiting 188 residents during 2012-3 to assess the diagnostic accuracy of clinical signs and symptoms of dehydration in this population. We found that none of the commonly-used signs and symptoms investigated were able to discriminate between residents with or without dehydration. These signs and symptoms included vital signs, urinalysis, skin, mouth and eye assessments, capillary and foot vein refill, feelings of thirst, tiredness or headaches.

4.8.2 Comparison with other studies

For serum osmolality we found a prevalence of 20% for residents with current dehydration, with a mean of 293mOsmol/kg (SD: 8) across the whole cohort. Few other studies involving care home residents have reported on dehydration using this measure. In the US, one study reported a prevalence of 57% (mean 297mmol/kg, SD: 8), but using a cut-off of >293mmol/kg for dehydration[152], whilst another study investigating the effects of an intervention to increase fluid intake reported baseline osmolality means of 304 (SD:9) and 303 (SD:9) in intervention and control groups, respectively[113]. In the UK, a 1989 study investigating the prevalence of serum osmolality in 39 female patients in continuing care (‘continuing care’ not defined) reported that 32 (82%) were hyperosmolar (serum osmolality >295mOsm/kg), with a mean osmolality of 302 (SD: 8mOsm/kg)[153]. In Japan, a care home study reported a rate of 23% in 391 residents, using a cut-off of >292mOsm/kg[154]. Thus, there seems to be considerable variation between studies, but with some studies reporting rates of dehydration, but using different cut-offs, and other studies reporting mean values, comparisons are difficult.

There have been numerous publications recommending the use of clinical signs and symptoms to screen for dehydration in older people, as older people are known to be at risk of developing dehydration and so recognising the signs and symptoms are seen as an essential component of care. Health professionals are expected to be aware of the signs and symptoms and they are described in many professional journals and textbooks. The evidence supporting the use of these signs and symptoms has been based on three key factors which recent developments in medical research have brought into question. Firstly, updated definitions of dehydration mean that as water-loss dehydration is distinct from hypovolaemia, the same signs and symptoms may not be interchangeable. Secondly, validation studies may have used a reference standard which would now be considered inadequate against which to which to compare the diagnostic value of clinical signs and symptoms. Thirdly, it is increasingly understood that studies examining diagnostic accuracy should be undertaken in the population in which they are to be used, rather than assuming that tests which are effective in other populations, such as young healthy men, will work as well in older and frailer care home residents. Not only does this make biological sense, but it is also ethical because of the risk of harm to people of using an unvalidated test[155].

In the recently-published Cochrane review[97] evaluating the diagnostic accuracy of clinical signs and symptoms in people ≥65 years to detect impending water-loss dehydration (using a cut-off of >295mOsm/kg) just three of the 67 stand-alone index tests (expressing fatigue, missing drinks between meals and BIA resistance at 50 kHz) were identified as having possible clinical utility. Of these, only ‘expressing fatigue’ was included in the current study and we reported a sensitivity and specificity of 0.34 (95%CI: 0.19, 0.49) and 0.58 (95%CI: 0.50, 0.66), respectively. In the review, of the three studies which included the index test ‘expressing fatigue’, two demonstrated similar levels of sensitivity but higher levels of specificity when compared to this study with only one other study demonstrating sensitivity and specificity above the review’s predetermined levels of >60% and >75% respectively (Table 4-11).

Table 4-11: Comparing sensitivity and specificity of ‘expression of fatigue’*

Study	n	Reference standard and cut-off	Sensitivity (95%CI)	Specificity (95%CI)
This study (DRIE)	188	serum osmolality >300mOsm/kg	0.34 (0.19, 0.49)	0.58 (0.50, 0.66)
Kajii 2006	71	serum osmolality >295mOsm/kg	0.71 (0.29, 0.96)	0.75 (0.63, 0.85)
Sjöstrand ED 2013	31		0.42 (0.23, 0.63);	0.80 (0.28, 0.99)
Sjöstrand Healthy 2013	13		0.30 (0.07, 0.65)	1.00 (0.29, 1.00)

**Details of Kajii and* Sjöstrand *studies taken from review by Hooper et al*[97]

A recent UK study published after the search for the Cochrane review was completed, also investigated the clinical utility of signs to detect water-loss dehydration in 130 older adults (>60 years) on admission to an acute hospital, and using plasma osmolality (which can be used interchangeably with serum osmolality, cut-off >295mOsm/kg) as the reference standard[98]. Fortes investigated ten index tests: seven were assessed dichotomously (resting tachycardia >100bpm, resting low systolic blood pressure, <100mmHg, dry mucous membranes, axillary dryness, poor skin turgor, presence of sunken eyes and capillary refill >2 seconds) and three were assessed as continuous variables (salivary osmolality, urine colour and USG)[98]. As with the current study, Fortes demonstrated that none of the signs demonstrated any diagnostic accuracy in this population, although salivary osmolality, which was not investigated in the current study, may have some potential ($\mathrm{ROC}_{\mathrm{AUC}}$: 0.76, p <0.001)[98].

In Japan, a cross-sectional study involving 391 older people investigated a number of clinical signs to detect ‘pre-dehydration’ using serum osmolality as the reference standard (cut-off >292mOsm/kg). They reported that constipation, drying of the oral cavity, dry skin, reduction in skin turgor and occurrence of neck oedema were the most useful diagnostic variables, but few further details were provided in this conference abstract (such as levels of sensitivity and specificity)[154]. In the current study we also investigated dryness of the oral mucosa and skin as well as skin turgor, but found no diagnostic utility for any of these tests. A subsequent paper by the same author (published in Japanese with an English abstract) reported on the development of a pre-dehydration assessment sheet in a smaller sample of older people (n=70) where they included dry skin in its 6-item scale[156].

Thus, when compared with serum or plasma osmolality, the accumulated evidence seems to support the findings from the current study that clinical indicators of dehydration are ineffective in identifying water-loss dehydration in older people. Although there appears to be a discrepancy between these studies and that of the Taniguchi study regarding utility of skin turgor, dryness of the oral mucosa and skin, further details of the Taniguchi study are required to account for the apparent differences, although the lower cut-off used by Taniguchi may be a major explanatory factor.

4.8.3 Limitations of the study

As with all studies, there are limitations resulting from the conduct and design of the study and these will be discussed further.

4.8.3.1 Recruitment

Recruitment to this study took longer than envisaged. In the initial proposal (http://driestudy.appspot.com/Files/DRIEprotocol.pdf) it was predicted that 25 care homes (containing approximately 1000 beds, mean of 40 beds per home) would be required to obtain the 200 residents required for the study. This was based on a recruitment rate of 25% of residents obtained from a previous, similar study where blood tests were included but optional[108]. However, recruitment rates for the present study were much lower, averaging 10% of residents per care home, so that a total of 56 care homes participated in the study, from the 148 who were initially approached.

When it became apparent during the study that recruitment rates were lower than expected, this issue was discussed informally with care staff and residents, and more formally with members of the Advisory and Steering Groups. Some issues were identified as being possible contributory factors:

- In some cases there appeared to have been misunderstandings about the nature of the study, its purpose and what it involved for the care home staff, the residents and their families. In part, this was due to the complexity of the study's procedures which needed to be communicated in order to obtain informed consent, but we also found that the majority of homes were research-naive, so we were also providing information on more general aspects of research as background. Thus, improving communication and providing summaries of the study information was an area we addressed. Of note is that ENRICH (Enabling Research in Care Homes), which aims to involve care homes in research, providing homes with general research information, was not established in Norfolk when the DRIE study began.
- An unwillingness on the part of some care home managers and families to involve residents in what was seen to be unnecessary invasive testing, particularly if residents were physically and/or mentally frail.
- An unwillingness by residents themselves to have extra tests, especially if they already had a number of comorbidities requiring on-going nursing and medical care.
- Communication within care homes between staff members was variable, so although the manager may have been 'on board', communication may not have filtered down.
- A lack of support or interest by relatives and/or care staff.
- Difficulties with venepuncture (section 4.7.3.1).
- Poor recruitment over the winter months, December–February (due to Christmas and increased number of related social activities together with increased levels of illness in both staff and residents, and staff holidays).

Some of the issues affecting recruitment could be more easily addressed than others, in particular we worked on and developed our approach to care home managers and staff, and we offered staff training sessions on dehydration. However, there were other factors which were beyond our control to influence directly, but being aware of the issues enabled us to manage and tailor our approach to account for these factors. This included recognising that the winter months are difficult times for the care homes, and that just because the manager was fully aware of the study, this did not necessarily mean that staff were aware, so we needed to be sensitive in our approach and be prepared to explain frequently who we were and what we were doing.

Despite the issues around recruitment, the resulting sample is still one of the largest of its kind to investigate the utility of clinical signs and symptoms to screen for water-loss dehydration on older people using serum osmolality as the reference standard. Whilst it could be argued that the recruitment of a non-random sample may affect the external validity of the study regarding the representativeness of the sample and thus the generalisability of the findings to the wider care home population[157], the comparisons between the study sample and the wider care home population did not appear to be substantial (Table 4-3).

4.8.3.2 Study design

A second limitation of this study was the cross-sectional design used to determine the diagnostic accuracy of the index tests when compared to the reference standard of serum osmolality. Whilst this provides a direct comparison between the index tests and the reference standard about the accuracy of the index tests to recognise current water-loss dehydration, it does not provide any indication about predictive validity, and the validity of the index tests in predicting patient outcomes which would indicate additional clinical utility[158,159]. The prospective diagnostic accuracy study investigating predictive validity for the index tests and reference standard on long-term outcomes is currently on going, with data collection nearing completion.

4.8.3.3 Exclusion of participants due to lack of reference test

A limitation in diagnostic accuracy studies is when a participant is excluded due to the lack of the reference standard test if the reference test is directly linked to the result of the test under evaluation[159]. In this study, venepuncture (to collect the venous blood sample necessary to assess serum osmolality) is technically more difficult in dehydrated people[89] and thus linked to the reference standard, as technical difficulties may have resulted in more residents with dehydration being excluded. However, dehydration is just one factor amongst several contributing to the technical difficulties of venepuncture. Other issues include body habitus with obese people having a greater amount of adipose tissue making palpation of suitable veins more difficult; older people, particularly if malnourished, have more fragile veins, and with a lack of adipose tissue to anchor them, veins move on contact with a needle. Older age leads to loss of elasticity of the vein walls and vasoconstriction occurs as a result of increased sympathetic tone and anxiety, and not just due to decreased intravascular volume. Arthritis, stroke or other conditions result in poor body positioning and arm extension, adding to the difficulties of locating a suitable vein[160,161]. Further, we conducted the blood tests in the residents' care home, so we did not always have the ability to improve the lighting conditions or the residents position and although low ambient temperatures were not generally a problem, residents may still have felt cold with the resultant vasoconstriction. As the interview was terminated if we did not obtain a blood sample, we have no further information about these residents other than age and sex, and although the mean age was consistent with the general DRIE population, there were more women, and being female is associated with increased vein fragility.

4.8.3.4 Low prevalence of some index tests

We included a small number of index tests because they had been reported in the literature, but we found a very low prevalence, and so this study may have been underpowered to assess their use. Such tests included ropey saliva and cracked lips (tests 13.1, 19.2). However, as dehydration prevalence was 20%, the expectation would be that had these index tests had any clinical utility, then we would have seen more occurrences.

4.8.3.5 Reliability testing

If any of the clinical signs and symptoms had demonstrated any diagnostic utility, the level of interrater agreement between researchers would have been a critical point of interest in determining the validity of the signs and symptoms clinically. Ideally, reliability testing of the categorical variables would have been undertaken using a weighted kappa which attributes less weight to agreement between categories further apart[150], but the statistical package used in this study (SPSS) does not support this function, so this analysis was not undertaken.

The levels of interrater agreement were variable, but it is worth noting that where two researchers who trained and worked together demonstrated low levels of agreement, this would have been magnified in a wider population of health professionals. We did not undertake any intrarater assessments, which would have contributed further evidence for any clinical utility.

4.8.3.6 Exclusion of some index tests

A further limitation which could be levelled at this study was the way in which we decided ***not*** to include a number of index tests described in the literature. These were:

1. Urine, tear and salivary osmolality. Measurements of osmolality require specialist laboratory equipment and staff. This means that the test would probably need to be requested by a GP, results would take several days to be returned (and would be returned via the GP, thus adding to the length of time) and there would be a cost involved. All of these issues make these tests inaccessible to care staff and the aim of this study was to identify index tests which care staff could use as part of their daily care. Further, sample collection is difficult in some residents.

2. BIA. Using BIA to assess dehydration requires specialist equipment which is expensive and so beyond the reach of most care homes, once again making the test inaccessible. Whilst care staff could be trained in its use and interpretation, this would be an additional expense. Further, residents need to be supine whilst having the test, so time is required to ensure the resident is in the appropriate position, which itself can be time-consuming. At the planning stage for this study, the evidence of any benefits arising from using BIA did not appear strong enough to warrant evaluating it, especially in the light of the other disadvantages.

3. Respiratory rate. Respiratory rate had only been included in one study in older adults where its utility was unproven[141]. Quality of respirations have been evaluated as a clinical sign in children, where sensitivity was low (0.43), but specificity was 0.86, and interrater variability was low (weighted kappa: 0.4)[162]. Therefore, it was decided not to include this test in the current study.

4.8.4 Strengths of the study

The strengths of this study relate to its internal validity, type of dehydration and reference standard used and the range of index tests examined.

4.8.4.1 Internal validity

This study's internal validity relate to its design and conduct. This was a primary study specifically designed to investigate the diagnostic accuracy of clinical tests and symptoms using a robust reference standard for water-loss dehydration, in older people living in care homes, and as such it is the largest study of its kind. We developed standard operating procedures to guide the researchers and ensure reproducibility of assessments.

4.8.4.2 Distinguishing water-loss dehydration from other types of dehydration

Water-loss dehydration, as it relates to intracellular dehydration is distinguished from other types, but particularly hypovolaemia, also known as salt-loss or extracellular dehydration[1] (section 2.5). Some earlier studies investigating the utility of clinical signs and symptoms have not distinguished between these two types, as we have here, thus accounting for some possible differences in findings.

4.8.4.3 Quality of the reference standard used

In this study we used serum osmolality as the reference standard as it is increasingly being recognised as the most appropriate standard for assessing water-loss dehydration[1,30]. Using the best test available minimises any uncertainties around the interpretation of the diagnostic accuracy of the index tests under investigation[159].

4.8.4.4 Range of index tests investigated

We investigated a range of clinical signs and symptoms which would seem to make biological sense when considering the underlying theoretical mechanisms (face validity). Thus a reduction in cell volume may be manifested as headache, lethargy, dry wrinkled skin, reduced skin turgor; reduced fluid excretion may be indicated by infrequent dark concentrated urine, dry lips, mouth, eyes, armpits, palms and low blood volume by slow capillary refill, low blood pressure or tachycardia.

4.8.4.5 Blinding

The researchers were blinded to the results of the reference test whilst interviewing residents and conducting the index tests. Similarly, the laboratory technicians undertaking the serum osmolality measures were blinded to the results of the index tests.

All participants were allocated a randomly-generated four-figure number, and this number was used to label all paper and electronic documentation and laboratory samples, except in the one table where identifying information was required for contact purposes. Whilst anonymity was essential for confidentiality, use of random numbers in this way meant that the researchers were also blinded during subsequent data analysis.

4.8.4.6 Feasibility

During the study feasibility issues were discussed with the Advisory Groups (both staff and residents) to ensure that the research remained grounded in everyday care home practice. If any test had been potentially useful, then the acceptability of the test to residents and the feasibility of using it by care home staff would have been crucial issues.

4.9 Publications arising from Chapter 4

I have been the lead author on two abstracts presenting the findings from the diagnostic accuracy study. For these abstracts I collected the data, conducted the analyses, wrote the abstracts and presented the findings.

(i) Bunn DK, Groves J, Hooper L. Clinical signs of water-loss dehydration are ineffective in older people living in residential care. Royal College of Nursing Annual Research Conference, Nottingham. Oral presentation. 2015. http://www.rcn.org.uk/.

(ii) Bunn DK, Shepstone L, Potter J, Hunter P, Hooper L. Can Urine Specific Gravity Screen For Dehydration In Older People Living In UK Residential Care? A Diagnostic Accuracy Study. Irish Ageing Studies Review. 2015. 6(1): 338 (abstract number 1299).

I co-authored seven publications on the wider DRIE study, as described below.

(i) Hooper L, Abdelhamid A, Ali A, Bunn DK, et al. Diagnostic accuracy of calculated serum osmolarity to predict dehydration in older people: adding value to pathology lab reports. 2015. BMJ Open;5:e008846.

(ii) Hooper L, Bunn D, et al. Which frail older people become dehydrated? The UK DRIE study. Journals of Gerontology Series A. 2015. doi:10.1093/gerona/glv205.

(iii) Siervo M, Bunn D, Prado C, Hooper L. Accuracy of prediction equations for serum osmolarity in frail older people with and without diabetes. American Journal of Clinical Nutrition. 2014. Sep; 100(3):867-876.

I contributed to the study's development, collected the data, assisted in writing the methods and discussion sections and critically reviewed the papers.

(iv) Jimoh F, Bunn D, Hooper L. 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 and Aging. 2015. 19(5):491-6.

I assisted in recruitment, the development of the Drinks Diary and critically reviewed the paper.

(v) Hooper L, Bunn D, Prado C, Siervo M. Assessment of dehydration in older people: agreement of measured serum osmolality with calculated serum osmolarity equations. 2014. 10th International Congress of the European Union Geriatric Medicine Society, Rotterdam, Netherlands. European Geriatric Medicine (Abstract Suppl;5:s80(04.25).

(vi) Hooper L, Bunn D. Predictors of dehydration in older people living in UK residential care. 2014. 10th International Congress of the European Union Geriatric Medicine Society, Rotterdam, Netherlands. European Geriatric Medicine (Abstract Suppl;5:s202(P385).

I contributed to the study's development, collected the data, and critically reviewed the abstracts.

(vii) Hooper L, Bunn DK, et al. Can we use urine to tell if we are dehydrated? Diagnostic accuracy in older people. Paper submitted.

I contributed to the study's development, collected the data, conducted the DRIE urinalyses included in the paper, assisted in writing the methods and discussion sections and critically reviewed the paper.

4.10 Summary and conclusions from Chapter 4

This study investigated the diagnostic utility of clinical signs and symptoms to screen for water-loss dehydration in older people living in care homes. This is the largest study of its kind to conduct such a study using a robust reference standard.

Conducting this study was necessary to provide up-to-date, evidence-based knowledge to care home staff to enable them to recognise residents who were becoming dehydrated, so that they could then institute the appropriate interventions to prevent further deterioration and possible morbidity and hospital admissions. Tools to recognise dehydration in this way fulfils the requirements of the CQC (section 1.6.2).

This study found no evidence to support the diagnostic accuracy of any commonly-used clinical signs and symptoms. These findings need to be disseminated, alongside the message that using inaccurate tests is potentially harmful, and this holds true in both directions; an inaccurate test falsely indicating dehydration exposes a resident to an unnecessary intervention, and an inaccurate test falsely indicating euhydration would discourage staff from providing a resident with the increased fluids required.

In the absence of accurate tests of dehydration, an increased risk of dehydration should be assumed for all care home residents[47], and constant attention focussed on ensuring adequate drinks are supplied and drunk. The ways in which this can be managed are addressed more fully in Chapters 5 and 6.

Chapter 5: Systematic Review

5.1 Contributions

I developed and published the protocol, designed and executed the searches. I assembled and led the review team to duplicate screening of titles and abstracts, abstraction of data and assessment of study validity and I contacted study authors where necessary for additional information. I analysed the findings and reported them as a narrative synthesis after concluding that meta-analysis was not possible. As lead and corresponding author, I drafted the original manuscript which was critically reviewed by my co-authors at a later stage and submitted the paper, addressing reviewers' comments prior to publication. The material included in Chapter 5, which I have written, is taken from this paper including the tables and figures, although some of the text has been expanded upon.

5.2 Aim and introduction to Chapter 5

To conduct a systematic review following the Cochrane Collaboration's guidelines, to assess the effectiveness of interventions and examine the associations with modifiable environmental factors to improve fluid intake and/or hydration status in older people living in long-term care.

5.3 Methods

I used the methods recommended by the Cochrane Collaboration[19], as they are known to be robust and represent the 'gold standard' in systematic review methods[163,164]. In line with these guidelines I assembled a review team to duplicate the screening, eligibility and data extraction to ensure completeness and transparency and minimise any author biases.

5.3.1 Ethical considerations

As an academic study, not involving people or their individual data, this study did not require ethical review. However, the DRIE Steering Group and Advisory Groups provided guidance, particularly regarding the nature of the findings and whether they would be applicable to care homes known to them.

5.3.2 Refining the research question and development of the protocol

A systematic review answers a very specific research question, but developing the research question requires a thorough understanding of the subject area, with clear definitions formulated of the population and setting of participants, the nature of the interventions of interest as well as their comparators, which outcome measures are the most appropriate to assess effectiveness, and the validity of those measures, and finally what study designs should be included. The framework for the development of the research question is PICOS (participants, interventions, comparators, outcomes and study designs).

5.3.3 Participants and setting

For this review, participants should be ≥65 years of age at the time of entry to the study, living in long-term care and able to eat and drink orally.

Age ≥65 years is the accepted cut-off for defining an older person[165], so in this review, if included studies comprised younger participants and/or participants living in other settings, it was planned to exclude these participants from the analyses if possible, but if this was not possible, the study would be included if the majority of participants met these criteria.

Defining the setting in this review was challenging because of the diversity of terms used to describe long-term care and the types of settings it encompassed. The nature of long-term care provision has altered substantially over time in the UK, and there are considerable differences in how long-term care is currently provided both within the UK and internationally[166]. Thus, recognising that there are many types of long-term care where homes vary in size, funding, ethos and location, and where people are housed with diverse needs and requiring different levels of care, this review took a broad view using the term 'long-term care'[2] as an umbrella term, and defining this as:

> *"A permanent setting where older adults reside in an institution where at least two other unrelated people reside. Residents share living facilities and require care, which is provided by staff. The institution is responsible for providing*

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[2] The original umbrella term of 'residential care' was changed to 'long-term care' when the review was published[187], for clarity to an American readership, and thus I have continued to use 'long-term care' as the umbrella term in this chapter.

> *meals and beverages. These will include nursing homes, residential care homes, long-term geriatric wards in hospitals and other similar institutions. They will not include acute care settings (acute care is a temporary care setting, to provide specialist care in order to treat a condition or conditions, with a view to discharge to a more permanent setting).”*[167]

Additionally, in this chapter, I have also used the terms for ‘long-term care’ as used by individual study authors when discussing their individual studies.

As admission to acute care is regarded as a short-term, temporary event to provide specialist care in order to diagnose and treat a particular condition or conditions and where the medical reason for admission is of prime concern, the focus on hydration care will alter and be intricately linked to the medical reason for admission. Similarly, people living in the community outside of an institutional setting are generally more independent (although not necessarily so) but their needs and associated hydration care will also differ from those living in long-term care.

5.3.4 Interventions and exposures

Intervention and observational studies were included where the intervention was clearly described and aimed to improve hydration or the observational study correlated dehydration assessment or fluid intake with a modifiable exposure.

Interventions and exposures could be administrative, educational, behavioural, social and/or environmental as well as other similar types not previously thought about, but pharmacological and surgical interventions and exposures were excluded, and so were unmodifiable factors, such as intrinsic resident characteristics or climatic influences.

Studies of nutrition were included if there was specific reference to dehydration or fluid intake.

5.3.5 Comparators

In the intervention studies, the comparators utilised by the studies were assessed for their appropriateness, and included in the quality assessment of the study. Similarly in the observational studies the non-exposed groups were the comparator and the appropriateness of the groups were considered as part of the quality appraisal.

5.3.6 Outcomes

The primary outcome measures were either an assessment of hydration status and/or fluid intake applied before and after the intervention (intervention studies). Observational studies were included if there was an assessment of the relationship between the exposure and the outcome measure (assessment of hydration status and/or fluid intake).

Secondary outcomes were reported if there was a suspected link to dehydration (such as stroke, urinary tract infection, upper respiratory tract infection, constipation, falls or death) but only if a primary outcome had been described.

5.3.7 Study design

Intervention and observational study designs were included.

5.3.7.1 Intervention

- Randomised controlled trials (RCTs, individual or cluster).
- Non-randomised clinical trials (CCTs).
- Randomised controlled cross-over trials (RCTc).
- Before-after studies (‘pre-posttest’ in the US).

5.3.7.2 Observational

- Cohort studies (prospective and retrospective).
- Cross-sectional studies.
- Case-control studies.

Studies published in all languages were included, restricted to humans, but with no restriction on publication date. I conducted a structured search of key electronic databases covering medical, nursing, social care and trials registers. Reference lists of reviews and included papers were searched further by hand. Following completion of the searches, a further search was undertaken of key authors where they had published >3 relevant reports (Gaspar, Kayser-Jones, Mentes, Simmons, Schnelle).

Initially, a scoping search was undertaken in MEDLINE (OvidSP) to pilot the search strategy and test its sensitivity using known papers. The search used the established filters of the Cochrane Collaboration to capture study designs of interest[19], and these were combined with indexing and keyword terms and synonyms for participants, setting and outcomes. Discussions within the review team helped to identify relevant terms and synonyms. The pilot search identified a large number of studies where alcohol was the key issue of interest, as the terms ‘drink’ and ‘drinking’ were part of the search strategy. This highlighted a recurring confusion in the studies in this thesis – the way in which ‘drink’ or ‘drinking’ is often synonymous with alcoholic drinking. Therefore, the last line of each search included the phrase ‘not alcohol*.ti’, thus excluding any study where alcohol was mentioned in the title, which would have indicated that alcoholic drinking was the main subject of the reported study. The final MEDLINE search is included in Appendix 10 and was registered with the full protocol on PROSPERO (International Prospective Register of Systematic Reviews) on 15/10/2012, Registration Number: CRD42012003100[167].

The preliminary MEDLINE search was adapted for use in the remaining twelve electronic databases: Embase (Excerpta Medica database), PsycINFO (both OvidSP), CINAHL (Cumulative Index to Nursing and Allied Health Literature, EBSCO Host), British Nursing Index, ProQuest Theses and Dissertations, Cochrane Central Register of Controlled Trials, PROSPERO, Centre for Reviews and Dissemination, Open Thesis, The Kings Fund, WHO International Registry of Clinical Trials Platform and the ISRCTN metaRegister for Controlled Trials. These last five databases were unable to handle the more complex search strategies used in the larger databases, so the search strategies were simplified accordingly.

All searches were repeated towards the end of the study to capture any relevant publications published in the interim, so the final search was completed 30th September 2013.

All results were downloaded to a reference management system and duplicates removed.

5.3.8 Study selection

Titles and abstracts were screened in duplicate and full-text papers were obtained if either reviewer considered it potentially eligible or there was ambiguity.

All full-text papers were grouped into studies and assessed for inclusion independently by two reviewers (DB and a co-reviewer) using a standard proforma (Appendix 11). This process was piloted on a sample of 10 papers. Any disagreements between reviewers were resolved by discussion, with a third reviewer arbitrating where necessary.

Corresponding authors were contacted when papers were published in languages other than English (in case they had an English translation), or there was insufficient data to assess suitability for inclusion or essential data were missing which the methods implied may be available. For non-English studies thought to be relevant, the services of a translator were obtained.

5.3.9 Data extraction

As with study selection, data extraction and risk of bias were duplicated independently by two reviewers (DB and a co-reviewer) using a standard proforma (Appendix 12), and we met to discuss findings and resolve any differences, with a third reviewer arbitrating if necessary. Where a reviewer was also a study author (LH) she was not involved in any study selection or data extraction for that study.

We extracted bibliographic details and information on funding source, ethical approval, study design, determinants of sample size, participants and setting, details of recruitment, the intervention and control or exposure, duration and completeness of follow-up and outcome data. For dichotomous outcomes we extracted numbers of participants, events and odds ratios (OR) or relative risks (RR). For continuous outcomes we extracted number of participants, means and standard deviations (SD) of change in, or final readings of, outcomes in each treatment arm. P values were checked using reported data and these values were reported if they were different.

5.3.10 Risk of bias and methodological quality

‘Risk of bias’ and quality appraisal are two terms often used interchangeably, but the Cochrane Handbook distinguishes between them. It describes ‘bias’ as systematic error which can operate in either direction leading to either under- or over-estimation of the true effect. By assessing the risk of bias, reviewers should consider the extent to which the results of an included study can be believed. The handbook further distinguishes between external and internal validity, where external validity refers to whether the study asks an appropriate research question, so is closely related to the generalisability of the findings, and internal validity refers to whether the research question was addressed correctly. The handbook describes quality as the way in which the study is conducted, taking into account such issues as funding, ethical approval and conduct[168].

Data required to assess external validity and quality were abstracted alongside other study data, whilst internal validity, evaluating the effects of systematic error, was assessed using standard tools: the Cochrane Risk of Bias tool for intervention studies[19], and the Newcastle-Ottawa Scales (NOS) for observational studies[169]. Whilst the Newcastle-Ottawa Scale has been criticised for its unknown validity (it was developed using the Delphi technique and has not been published in a peer-reviewed journal for open comment)[170], it is widely used and recommended as the tool of choice by the Cochrane Handbook and following a Health Technology Assessment Review by Deeks et al[171,172].

In the Cochrane Risk of Bias Tool, the effects of systematic error are evaluated according to six items: random sequence generation, allocation concealment, blinding of participants and personnel, incomplete outcome data and selective reporting. In this review we judged each item as high or low risk of bias using the guidelines provided by the Cochrane Handbook to assign risk level[168]. A judgement of 'unclear' was made where there was insufficient evidence to judge and further details were unobtainable from the authors. In addition to the standard items we included a further item assessing risk of bias of the outcome measure(s) used (Appendix 13).

For observational studies internal validity was assessed using the Newcastle-Ottawa Scales for case-control and cohort studies[169] and adapted for this review (Appendix 14). Both scales have eight items assessing three criteria: selection and representativeness of participants; comparability of groups and ascertainment of exposures and outcomes. Criteria were specified by two authors (DB, LH) and included definitions for dehydration and fluid intake assessment, whether confounding characteristics of age, gender and frailty were controlled for and adequacy of follow-up. Each of the eight items contain between two and four categories and the category associated with the lowest risk of bias is starred. A maximum of nine stars is achievable, because it is possible to achieve two stars for the item assessing comparability.

For all study types, risk of bias associated with assessment of dehydration status and/or fluid intake ascertainment was judged according to the following criteria:

- The appropriateness of the method chosen.
- How it was conducted and whether the method selected had been validated previously.
- Reporting of intra- and interrater reliability.

- Any other limitations of the method. Of key interest was whether fluid intake had been conducted over a 24-hour period. If fluid intake was only assessed over a proportion of the day, then the effectiveness of the intervention on total fluid intake could not be evaluated.

5.3.11 Data synthesis

Findings were reported following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, with the checklist included as an Appendix (Appendix 9)[130].

The results of the search are presented in a study flow diagram demonstrating the results of the combined searches before and after de-duplication, number of records screened and full-text papers retrieved, the number of records combined when relating to the same study and the final number of studies included in this systematic review.

Study findings are reported as a narrative synthesis, grouped according to type of intervention or exposure. ‘Summary of Characteristics Tables’ for intervention and observational studies provide brief details of each study including date, location, setting, study design, and condensed details of participants, interventions and outcome measures. The results of the internal validity assessments are displayed in risk of bias tables and commented on further in the text, together with a discussion of the external validity and methodological quality.

Meta-analysis, the statistical pooling of data from more than one study to generate summary estimates of effects, was planned using random-effects analysis which allows for some heterogeneity between studies and so studies are weighted using a combination of their own variance and the between study variance (compared to fixed-effects models which assume that all variation occurs within studies so no allowance is made for between-study variation and where estimates of effect between studies are seen as being due to random error)[173].

Separate meta-analyses were planned for the intervention and observational studies, but in both instances random-effects meta-analysis was not possible as there were insufficient similarities between included studies. The heterogeneity of included studies was due to study design, interventions or exposures and outcome measures used.

The planned meta-analyses would have combined study estimates for similar effects of interest and so increased the power of the estimates of treatment effect. A summary characteristic and confidence intervals would have been calculated for each study to describe the observed intervention effect (risk ratios or odds ratios for dichotomous data and difference between means for continuous data). These would then be weighted to allow for differences, such as sample size and event rate and the results displayed as forest plots using Review Manager[174].

If meta-analysis had been possible, then further sensitivity analyses to investigate the robustness of the primary meta-analyses would have been considered, as well as sub-group analyses. The findings would have been presented in a ‘Summary of Findings’ table describing the quality of evidence, participants, magnitude of the intervention effects and data on the main outcomes.

5.3.12 Protocol changes

Any deviations or changes to the original protocol were documented, together with explanations as to why this may have occurred. There were no major changes, but a number of clarifications were made as the review team came across new terms or types of interventions and exposures. We clarified the terms: ‘environmental’ (modifiable factors only), ‘dehydration’ (‘water-loss’ or hypernatraemic, not hyponatraemic), ‘fluid intake’ (oral only).

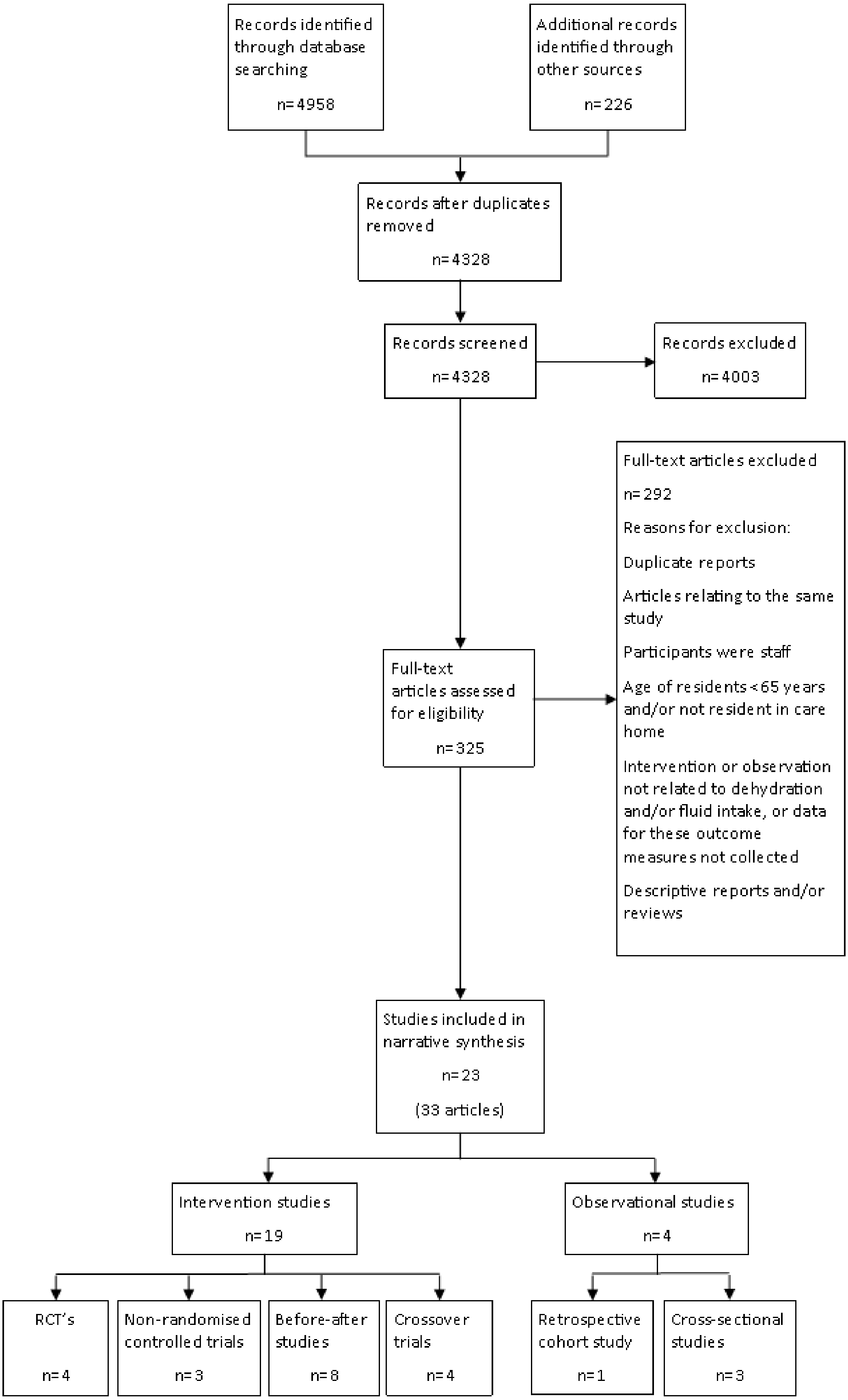
5.4 Results

5.4.1 Selection of studies

Electronic searches identified 4958 titles and abstracts with an additional 226 from reference lists and searches of key author’s publications, totalling 5184. After removing 856 duplicates, 4328 titles and abstracts were screened, and full-text papers obtained for 325. Of these, 292 were excluded, 10 were related publications of included studies and 23 studies (19 intervention, 4 observational) were included in this review, Figure 5-1, which also describes reasons for excluding studies.

The majority of studies were based in North America (14 US[49,52,59,60,113,114,118,175–181], 3 Canada[182–184]); four in Europe (2 UK[108,185], 1 Ireland[186], 1 Germany[111]) and two in Asia (Japan[115], Taiwan[68]). Characteristics of included studies are described in Table 5-1 (intervention studies) and Table 5-2 (observational studies).

*Figure 5-1: Study Flow Diagram**



**taken from paper by Bunn, 2015*[187]

*Table 5-1: Brief characteristics of included intervention studies**

Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
Allen, 2011[185,188]. UK	RCT	24 nursing home residents with cognitive impairment; ***Group 1*** =8, ***Group 2*** =16 Age, mean (SD): 86 (9) MMSE, mean (SD): 11 (10); range: 0-30	***Intervention, Group 1:*** Straw inserted into ONS bottle ***Intervention, Group 2:*** ONS decanted into glass/ beaker ***Duration:*** x3 per day, alternate days, 1 week	Proportion of ONS consumed/number of drinks served. ***Method of assessment:*** Amount of ONS consumed estimated as a proportion of amount served (0.1, 0.25, 0.5, 0.75, 1.0). Method of estimation not described.
Allison, 2005[175]. US	Before-after	281 residents of long-term care facilities *(sub-study)*	***Intervention:*** Senior facility staff evaluated participants and intervened with appropriate care if required (not described) to improve hydration ***Duration:*** 3-4 months	Change in TBR. ***Method of assessment:*** Quantum II Bioimpedance Anlayzer. Software: Cyprus Body Composition Software system - RJL Systems Equation: TBW/(height2/TBR) x height/Resistance.
Cleary, 2008[182]. Canada	Before-after	3 residents in long-term care facilities at risk of nutritional decline Age, mean: 93 MMSE, mean: 11	Regular seating plan instituted for this study at lunchtimes ***Duration:*** N/R, but 12 meals observed over non-consecutive days	Change in percentage of fluids consumed at lunch, as a proportion of amount served (amount served N/R). ***Method of assessment:*** N/R.
Dunne, 2004[176]. US	Before-after	9 men with advanced Alzheimer’s Disease living in long-term care; ***Study 1*** =9, Age, mean: 83. MMSE, mean: 3 ***Study 2*** =9 (includes 5 from study 1), Age, mean: 83. MMSE, mean: 3	***Study 1:*** white tableware (control), high-contrast red tableware, white ***Duration:*** 30 days (10 days each) ***Study 2 (1 year later):*** white tableware, high-contrast blue (n=9), white, low-contrast red (n=7), white, low-contrast blue (n=6), white ***Duration:*** 70 days (10 days each)	Change in mean percentage of fluid intake. ***Method of assessment:*** Food and fluid intake recorded every day for each participant at lunch Amount consumed expressed as a percentage of amount served. Amount served was weighed in ounces.

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Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
Fries, 1997[177]. US	Before-after	Nursing home residents, ***Pre-RAI*** =2128; ***Post-RAI*** =2088 (new cohort) >65 years: n=3908 (92%)[†] Males: 1026 (23)[†] CPS: 31% intact; 35% moderate; 35% severe	***Intervention:*** Implementation of RAI-MDS during 1990-1	Change in baseline dehydration prevalence. Change in number of residents acquiring dehydration or improving during 6-month follow-up. ***Method of assessment & definition of dehydration:*** Dehydration present/absent as defined by the RAI-MDS, ≥2 criteria present from the following: Fluid intake <1.5l/day Clinical signs of dehydration Fluid loss > fluid intake. Methods used to assess these N/R.
Holzapfel, 1997[118]. USA	RCTc	39 nursing home residents requiring complete feeding assistance Age, mean: 75 (95% ≥60 years) Males: 3 (8%) Dementia diagnosis: n=22 (56%)	***Intervention groups:*** Feeding assistants sat for 2 weeks, then stood for 2 weeks, then crossed over. ***Control:*** Feeding assistants chose positions (positions chosen N/R) ***Duration:*** Lunch, Monday – Friday, 4 weeks	Differences in mean fluid intake between groups on days 1, 5, 10, 15 & 20 (results presented as *p* value & t statistic only). Food and fluid consumed, at mid-day meal only, was recorded by the feeder using four pre-determined categories of percentages (0-25%, 26-50%, 51-75%, 76-100%). Not known if this was measured or estimated. Fluid defined as being able to be consumed through a straw.
Kenkmann, 2010[108]. UK	Cluster CCT	56 residents in residential care *(sub-study)*. ***Intervention*** =30 MMSE, mean (SD): 19 (6) Number attempting chair-stands: 6 (20%) ***Control*** =26 MMSE, mean (SD): 17 (6) Number attempting chair-stands: 4 (15%)	***Intervention:*** Restaurant atmosphere, extended mealtimes, increased choice of foods, social experience, encouragement to eat, availability of drinks and snacks ***Control:*** 'Usual care' (not described). ***Duration:*** 12 months	Change in number of residents with dehydration. ***Method of assessment & definition of dehydration:*** Presence of either: Dry, furrowed tongue Dry mucous membrane

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Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
				Sunken eyes Methods used to assess these N/R
Lin, 2013[68]. Taiwan	Cluster CCT	74 incontinent nursing home residents. ***Intervention*** = 44 Age, mean (SD): 76 (13) Males: 14 (32%) SPMSQ, mean (SD): 5 (4) Barthel Index, mean (SD): 29 (24) ***Control*** =30 Age, mean (SD): 75 (11) Males: 15 (50) SPMSQ, mean (SD): 7 (3) Barthel Index, mean (SD): 32 (25)	***Intervention:*** Advice to increase fluid intake to >1500ml/day, unrestricted drinks choice ***Control:*** Unrestricted drinks, residents could choose type and amount. ***Duration:*** 6 weeks	Change in mean fluid intake. ***Methods of assessment:*** Fluid input/output charts completed by facility staff, but methods of measuring fluids N/R.
McCormick 2006[186,189]. Ireland	RCTc	11 long-term care residents with dysphagia Age, mean: 76 Males: 3 (27%) MMSE administered, N/R Barthel Index, mean: 0.4	***Weeks 1-6:*** Group A received commercially-prepared pre-thickened drinks, Group B received drinks thickened at bedside ***Weeks 7-12:*** Group A: drinks thickened at bedside, Group B: commercially-prepared pre-thickened drinks ***Duration:*** 12 weeks	Difference in amount of thickened fluids consumed. ***Method of assessment:*** Daily assessment of total fluid intake using graduated cups.
Mentes, 2000[109,178,190]. US	Cluster RCT	49 nursing home residents. ***Intervention*** = 25 Age, mean (SD): 81 (10) Males: 11 (44%) MMSE, mean (SD): 22 (6) FIM, mean (SD): 79 (22) ***Control*** =30 Age, mean (SD): 83 (9) Males: 11 (46%) MMSE, mean (SD): 25 (4)	***Intervention:*** Calculation of weight-based fluid intake goal. 75% of fluid goal to be drunk at mealtimes. Increased choice and availability of drinks, 'sip-and-go' cups and tagging of charts and trays for 'higher-risk' residents. ***Control:*** Routine care (not described). ***Duration:*** 8 weeks	Change in urine colour and USG. Change in fluid intake and number of residents achieving >75% of fluid goal. Change in TBW. ***Method of assessment:*** 1. Standard urine colour chart 2. USG, assessed using Chemstrip Mini Urine Analyser Weekly urine assessments.

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Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
		FIM, mean (SD): 112 (11)		3. 2x 24 hour fluid intake records documented at baseline. During each week of the intervention a partial fluid intake record of drinks taken at mealtimes, medication and fluid rounds, was documented. Caffeinated and alcoholic beverages were excluded. Method of assessment N/R. 4. BIA-101 Quantum Analyser (RJL systems, Clinton Township). Equations referenced. BIA conducted at baseline, weeks 4 and 8.
Robinson, 2002[59]. US	Before-after	51 nursing home residents Age, mean: 84 Males: 8 (16%) Dependency n (%): Complete: 9 (18); Holds glass: 25 (49); Independent: 17 (33)	***Intervention (7 days a week, 5 weeks):*** Goal: to drink 8oz more fluids twice a day. Hydration assistant for fluid administration. Increased choice. Colourful beverage cart, jugs & glasses ***Duration:*** 9 weeks (includes 2 weeks baseline and 2 weeks follow-up)	Number of participants drinking extra 16floz/day. Change in TBW. ***Method of assessment:*** Fluid intake monitored mid-morning & afternoon only. Use of BIA to assess TBW, methods not described, and information regarding type of machine, and equations used N/R.
Schnelle, 2010[60]. US	RCT	112 nursing home residents with faecal and urinary incontinence ***Intervention*** =58 Age, mean (SD): 86 (9) Males: 16% MMSE, mean (SD): 13 (8) Sit-to-stands, number performed, mean (SD): 4 (3) Walk/wheel distance, meters, mean (SD): 59 (50) ***Control*** =54 86 (11) Males: 19% MMSE, mean (SD): 10 (8)	***Intervention***: Research staff checked residents for incontinence, offered toileting assistance, choice of snack & drink, prompts to exercise. ***Control:*** Usual care (not described). ***Baseline & post-intervention (1 week each, both groups):*** Research staff offered toileting assistance and checked for UI & FI. ***Duration:*** 12 weeks (weekdays, 7.00am–3.30pm, 2 hourly)	Change in between-meal fluid intake. ***Method of assessment:*** Fluid intake assessed using validated assessment (Simmons et al, 2000).

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Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
		Sit-to-stands, number performed, mean (SD): 2 (2) Walk/wheel distance, meters, mean (SD): 54 (56)		
Simmons, 2001[113]. US	RCT	48 incontinent nursing home residents *(sub-study)* ***Intervention*** =23 Age, sex and MMSE N/R for this sub-group ***Control*** =15 Age, mean (SD): 86 (6) Males: 5 (33%) MMSE, mean (SD): 14 (7)	***Intervention:*** Usual care and x4 prompts to exercise per day and x4 prompts or help with toilet, changed if wet +: ***Phase 1 (weeks 1-16):*** x4 verbal prompts to drink ***Phase 2 (weeks 17-24):*** x8 verbal prompts to drink ***Phase 3 (weeks 25-32):*** x8 verbal prompts to drink, increased choice of drinks and appropriate assistance provided. ***Control:*** Usual care (not described) ***Duration:*** 5 days per week for 32 weeks	Change in serum osmolality and BUN:creatinine ratio. ***Method of assessment:*** Venepuncture, methods N/R.
Spangler, 1984[114]. US	RCTc	16 non-ambulatory nursing home residents with incontinence Age, range: 59-96 (mean, SD N/R) Males: 2 (13%)	***Intervention:*** Research staff offered choice and help with cold drinks and toileting assistance every 1.5 hours, 6.00am-9.00pm. ***Standard Care:*** 3-hrly checks for soiling; no offers of drinks, but requests for drinks were met. ***Duration:*** 50 days (10 days baseline, 10 days each crossover period, 10 days standard care for both groups, 10 days when intervention delivered by facility staff to all participants)	Change in mean USG. ***Method of assessment:*** USG assessed using urinometer.
Tanaka, 2009[115]. Japan	Before-after	122 nursing home residents able to sit up and communicate need to defecate Age, mean: 85 (SD N/R) Males: 18 (15%) Dementia level, n (%): I (mild): 2 (2); II: 18 (15); III: 59 (49); IV: 42 (35)	***Intervention:*** Senior nurses received training then trained staff to increase fluid intake to 1500 ml/day by providing drinks early morning, between meals and bed-time, verbal and physical assistance and increased choice. Assistance provided with toileting and wet incontinence pads changed 2-hourly. Residents to remain out of bed for >6 hours.	Mean change in fluid intake. ***Method of assessment:*** 3-day mean fluid intake assessed at baseline and 12 weeks. Methods N/R.

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Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
		Dependence level, n (%): J1 & 2 (independent): 0 (0); A1: 7 (6); A2: 15 (12); B1: 28 (23); B2: 52 (43); C1: 7 (6); C3: 12 (10)	***Duration:*** 12 weeks	
Taylor, 2006[184]. Canada	RCTc	31 residents with dysphagia living in extended care facilities Age, mean (SD): 85 (6) Males: 5 (16%)	***Intervention:*** Five meals/day, matched to the 3 meals for energy content. ***Group 1:*** 5 meals/day for 4 days; ***Group 2:*** 3 meals/day for 4 days ***4 weeks later:*** ***Group 1:*** 3 meals/day for 4 days; ***Group 2:*** 5 meals/day for 4 days ***Duration:*** 4 weeks	Difference in fluid intake at mealtimes. ***Method of assessment:*** Fluid defined as any food usually drunk, or is liquid at room temperature before thickening. Food and fluids not provided by hospital staff were not weighed, but recorded as % consumed. This data N/R.
Welch, 1996[180]. US	Before-after	13 mildly dehydrated nursing home residents Age, mean: 89 (SD N/R) Males: 1 (8%)	***Intervention:*** Oral hydration fluids offered when standard fluid intake was less than the weight-based calculated goal for daily fluid intake. Method of how increased fluids were promoted not described. ***Duration:*** 5 days	Change in serum biochemistry. Change in fluid intake. ***Method of assessment:*** Serum biochemistry assessed days 1, 3, 5. Fluid intake assessed daily, methods N/R.
Willms, 2003[111]. Germany	Before-after	70 residents requiring nursing care Age: 64–69: 5 (3%); 70–79: 36 (20%); 80–89: 82 (45%); 90–99: 57 (32%); >100: 1 (1%) Males: 24 (13%) Care levels, n (%): 1: 10 (15); 2: 37 (54); 3 (dependant): 21 (31)	***Baseline: 10 days*** ***Intervention (duration unknown):*** Education for staff and residents. Provision of water fountains, drinks delivered at set times and increased choice of drinks taking into account colour and taste. Increased assistance, such as physical help, thickening drinks and use of drinking aids. ***Follow-up period: 10 days***	Change in mean fluid intake. ***Method of assessment:*** Fluid intake assessed daily by nursing home staff using calibrated containers. No information provided regarding time period (whole or part of day).

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Author	Study Design	Participant characteristics at baseline	Intervention, control and study duration	Outcome measure(s)
Zembrzuski 2006[181]. US	CCT	82 residents of skilled nursing facilities ***Intervention*** =48 Age, mean (SD): 88 (6) Males: 9 (19%) MMSE, mean (SD): 21 (6) ***Control*** =34 Age, mean (SD): 86 (7) Males: 5 (15%) MMSE, mean (SD): 16 (9)	***Intervention:*** Increased choice of drinks, increased assistance and monitoring; between-meal drinks offered at least twice daily for 30 days. ***Control:*** Routine care: general standard for offering drinks, drinks provided on request, increased drinks for 'at risk' residents. ***Duration:*** 30 days	Change in mean fluid intake. ***Method of assessment:*** Fluid intake observed over 12 hour period for 3 days prior to study commencement and for 3 days at the end of the intervention using graduated cups.

**taken from paper by Bunn, 2015*[187]

†reported as raw frequency and weighted percentages of the total population they represent (n=121,337)

*Table 5-2: Brief characteristics of included observational studies**

Author	Study design	Participant characteristics at baseline	Exposure(s) (independent variables)	Outcome measure(s) (dependant variable/s)
Dyck, 2006[49,191]. US	Cross sectional (2º analysis of RAI-MDS & OSCAR databases)	363,895 residents from 2951 nursing homes in 6 mid-west states Age, mean (SD): 84 (8) Males: 99,612 (27%) Cognition and physical function N/R	Type of ownership (government-owned, not-for-profit, for-profit, chain facility) Reimbursement method Facility location (urban, rural) Case mix index Staffing: HRD by grade of staff (RN, LPN, CNA)	Risk of dehydration according to facility and staffing factors. ***Definition of dehydration:*** Dehydration present/absent, as defined by ICD-9-CM diagnostic code of 276.5, or as defined by the RAI-MDS J1c, ≥2 criteria present from the following: Fluid intake <1.5l/day Clinical signs of dehydration Fluid loss > fluid intake. Methods used to assess RAI-MDS criteria N/R.
Gaspar, 1999[52,104]. US	Cross sectional	99 residents from 3 nursing homes Age, mean: 85 (SD N/R) Males: 23 (23%) Able to respond to interview questions: 51 (52%) Norton score[#], mean: 15 (SD N/R)	Number of ingestion sessions Who initiated the ingestion Place of ingestion Positioning of resident's upper body and head during feeding	Total water intake (from food and fluids). ***Method of assessment :*** Observations of food and fluid intake for 2x24hr periods during one week. Coding manual used to code water content of foods and fluids.
McGregor, 2006[183]. Canada	Retrospective cohort using British Columbia-linked health databases	43,065 hospital admissions from extended care facilities (representing 23,868 beds) between 01/04/1996-01/08/1999 Age, mean (SD): 82 (10) Males: 14,757 (34%) Care level, n (%): I/II: 16,062 (37) III: 12,089 (28) Extended: 14,914 (35)	Not-for-profit facilities, n (%): 212 (70) For-profit facilities, n (%): 89 (30)	Risk of admission to acute unit from a care facility due to dehydration (primary diagnosis). ***Definition of dehydration:*** Dehydration present/absent, as defined by ICD-9-CM diagnostic code of 276.5,

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Author	Study design	Participant characteristics at baseline	Exposure(s) (independent variables)	Outcome measure(s) (dependant variable/s)
Reed,, 2005[179]. US	Cross sectional	326 residents diagnosed with dementia, from 10 nursing homes and 35 RC/AL[†] *(sub-study)* Age, sex, degree of cognitive impairment and physical function N/R separately for sub-study	Staff:resident ratio Type of staff training in hydration and nutrition Facility environment Facility type and ownership New model RC/AL v ‘traditional’ model[†]	Risk of low fluid intake according to facility and staffing factors. ***Method of assessment & definition of dehydration:*** Low fluid intake defined as an intake of <8floz, assessed over a single observed meal-time (method of assessment N/R).

**taken from paper by Bunn, 2015[187]*

[#] *Norton Score used in this study to assess general physical and mental function, but it was validated to assess risk for development of pressure sores; possible scores range from 4-20. <9 =very high risk of developing pressure sores (due to impaired cognition, physical activity and bladder control); 10-13=high risk; 14-17=medium risk and 18-20=low risk.*

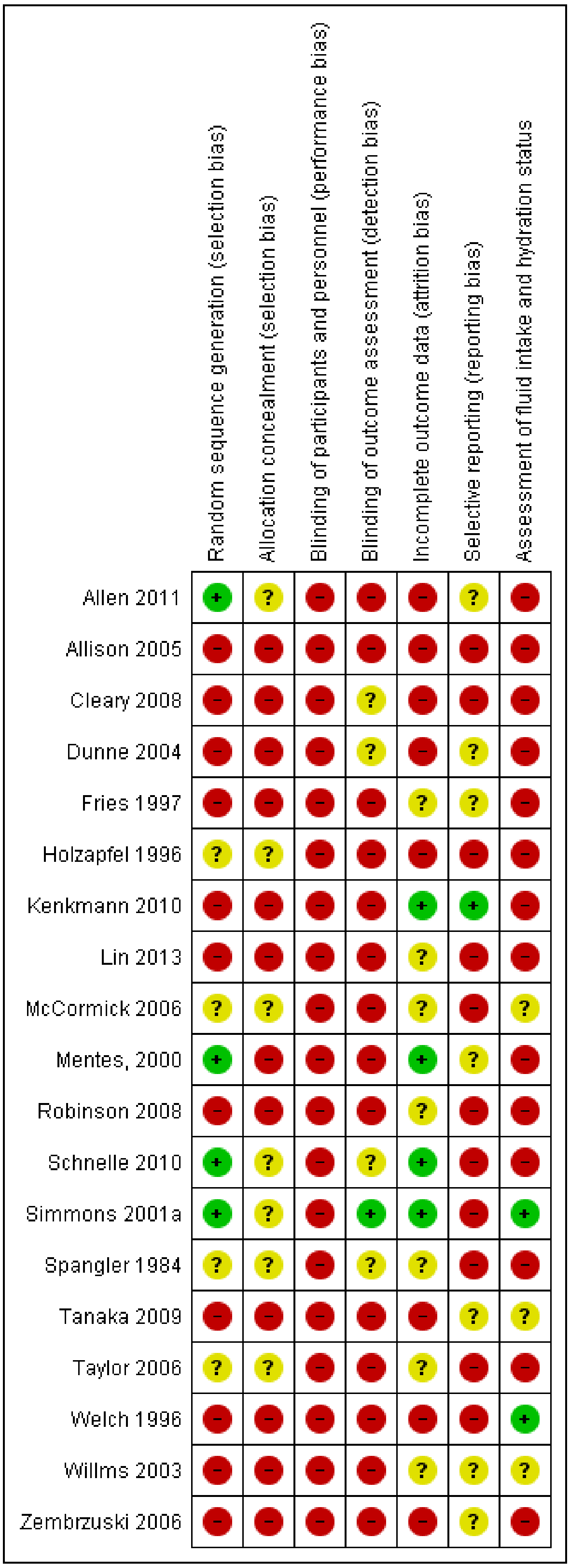
[†] *Residential/assisted living facilities (RC/AL) are non-nursing home settings which provide room, board and assistance with activities of daily living. New model RC/AL offers add-on services for residents requiring more care and/or nursing care.*

5.4.2 Risk of bias, validity and methodological quality

In intervention studies, random sequence generation was adequate in four studies[60,113,178,185,188], unclear in four[114,118,184,186], and inadequate in the remainder (where participants were recruited using non-random methods under the direction of facility or research staff[59,68,108,115,176,181,182], using screening tests[175,180] or resident lists[111,177] (Figure 5-2). None clearly demonstrated adequate allocation concealment, although seven were judged ‘unclear’[60,113,114,118,184–186,188] (three of these were low risk for random sequence generation[60,113,185,188]). Blinding of participants and those providing interventions, did not occur in any study. Only four studies[60,108,113,178] demonstrated low risk of attrition bias (reporting reasons for withdrawal, description of those withdrawing and whether analysis was intention to treat), while seven were unclear[59,68,111,114,177,184,186], and the remaining eight studies were judged high risk of bias[115,118,175,176,180–182,185,188].

In the four observational studies, the composite NOS scores ranged from 4 to 9, and the two larger studies[49,183] both scored eight, indicating lower risk of bias. The two smaller studies[52,179] had higher risk of bias due to doubt about the representativeness of participants (neither fully described the non-response groups) and ascertainment of exposures was unclear (Table 5-3).

Figure 5-2: Risk of bias for intervention studies*



	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Assessment of fluid intake and hydration status
Allen 2011	+	?	−	−	−	?	−
Allison 2005	−	−	−	−	−	−	−
Cleary 2008	−	−	−	?	−	−	−
Dunne 2004	−	−	−	?	−	?	−
Fries 1997	−	−	−	−	?	?	−
Holzapfel 1996	?	?	−	−	−	−	−
Kenkmann 2010	−	−	−	−	+	+	−
Lin 2013	−	−	−	−	?	−	−
McCormick 2006	?	?	−	−	?	−	?
Mentes, 2000	+	−	−	−	+	?	−
Robinson 2008	−	−	−	−	?	−	−
Schnelle 2010	+	?	−	?	+	−	−
Simmons 2001a	+	?	−	+	+	−	+
Spangler 1984	?	?	−	?	?	−	−
Tanaka 2009	−	−	−	−	−	?	?
Taylor 2006	?	?	−	−	?	−	−
Welch 1996	−	−	−	−	−	−	+
Willms 2003	−	−	−	−	?	?	?
Zembrzuski 2006	−	−	−	−	−	?	−

**taken from paper by Bunn, 2015*[187]

*Table 5-3: Risk of bias, observational studies**

Study Details	*Max number of stars achievable*	Dyck, 2006[49,191] (Cross-sectional)	Gaspar, 1999[52,104] (Cross-sectional)	McGregor, 2006[183] (Retrospective cohort)	Reed, 2005[179] (Cross-sectional)
Ascertainment of exposure	1	1	0	1	0
Case definition of dehydration	1	0	1	1	0
Representativeness of cases[#] or exposed cohort[†]	1	1	0	1	0
Selection of controls[#] or non-exposed cohort[†]	1	1	1	1	1
Definition of controls[#] or outcome not present at start of study[†]	1	1	1	0	1
Comparability of cases and controls	2	2	0	2	2
Same methods used to ascertain cases and controls[#]	1	1	1	n/a	1
Non-response rate[#] or adequacy of follow-up[†]	1	1	0	1	1
Follow-up long enough for outcomes to occur[†]	1	n/a	n/a	1	n/a
Total number of stars achieved	9	8	4	8	6

**taken from paper by Bunn, 2015[187]*

0 indicates high risk of bias, 1 or 2 indicates low risk of bias; [#]applicable to cross-sectional studies only; [†]applicable to cohort studies only; n/a indicates that the study is not being judged on this criteria

The method of assessing fluid intake or hydration status was judged low risk of bias in four studies[52,113,180,183], high risk in sixteen[49,59,60,68,108,114,118,175–179,181,182,184,185,188] and unclear in three[111,115,186]. Of four studies judged low risk, two assessed serum osmolality[113,180], one used ICD-9 codes only[183] and one measured all fluid intake over 24 hours using referenced methodology with good interrater reliability (r=0.98)[52]. Of the 16 high risk studies, eight assessed fluid intake only[60,118,176,179,181,182,184,185,188], four assessed dehydration status[49,108,114,177], and four used a combination of both fluid intake and dehydration assessment[59,68,175,178]. Fluid intake assessments were judged high risk if they were conducted for part of the day or method of ascertainment was not considered to be accurate, whilst dehydration assessments were judged high risk if they had not been validated against serum osmolality in an older population (urine specific gravity, USG,[68,114,178] urine colour[178], dry eyes and mouth[108], Resident Assessment Instrument Minimum Data Set definitions, RAI-MDS[49,177], and bioelectrical impedance analysis, BIA, to assess Total Body Water, TBW[59,178] or Total Body Resistance, TBR[175]. In total, six studies assessed both fluid intake and dehydration[59,68,113,175,178,180], but fluid intake was not fully reported in four of these[59,113,175,180] so risk of bias was assessed on the alternative reported measure. Just six studies reported results of any reliability checks between observers[52,60,68,118,177,182].

Blinding of outcome assessors occurred in two studies (those using biochemical markers of dehydration[113,180]), but could have been feasible in other studies if incorporated into study designs. Only one study reported on all outcomes with reference to a published protocol[108].

5.4.3 Findings from the studies

The findings from each of the studies are summarised in Table 5-4 and discussed in detail below (they were initially reported in the paper by Bunn et al, 2015[187]).

*Table 5-4: Findings from included intervention studies**

Author	Study design	Outcome measures, baseline levels	Outcome measures, results	*p*	Comments
Allen, 2011[185,188]. UK	RCT n=24	N/A	Results reported by authors proportion of ONS consumed per number of drinks served, mean (SD): ***Group 1 (straw in bottle):*** 0.62 (0.40) ***Group 2 (beaker):*** 0.81 (0.29)	0.002	
			Results re-analysed by reviewers as proportion of ONS consumed, per participant, mean (SD): ***Group 1 (straw in bottle):*** *0.62 (0.40)* ***Group 2 (beaker):*** *0.81 (0.29)*	0.23	
Allison, 2005[175]. US	Before-after n=281 *(results reported for 198)*	***TBR, ohms, mean (SD):*** 610 (37)	***TBR, ohms, mean (SD):*** 478 (60)	<0.001	Results reported for 198 participants. The remaining 83 participants described as having the same or higher baseline TBR readings at the end of the study, but TBR was assessed later at 5-6 months & that the intervention was not closely adhered to in this group.
Cleary, 2008[182]. Canada	Before-after n=3	***Fluid intake, % consumed, mean (SD):*** 63 (30)	***% fluid intake, mean (SD):*** 78 (30)	0.53	Figures N/R in text, extracted from graph independently by 2 reviewers. *p* calculated by reviewers
Dunne, 2004[176]. US	Before-after Study 1: n=9	***Study 1, fluid intake, % of fluids offered, mean (SD):*** High-contrast red tableware (n=9): 54 (37)	***Study 1, fluid intake, % of fluids offered, mean (SD):*** 88 (22)	0.02	***Study 1:*** *p* value recalculated by reviewers (reported *p* value: 0.001).
	Study 2: n=9	***Study 2**, **fluid intake, % of fluids offered, mean (SD):*** High-contrast blue (n=9): 77 (34). Low-contrast red (n=7): 88 (25) Low-contrast blue (n=6): 88 (25)	***Study 2, fluid intake, % of fluids offered, mean (SD):*** High-contrast blue (n=9): 92 (21) Low-contrast red (n=7): 88 (25) Low-contrast blue (n=6): 90 (22)	0.26 1.00 0.88	***Study 2:*** *p* values calculated by reviewers

(continued on next page)

Author	Study design	Outcome measures, baseline levels	Outcome measures, results	*p*	Comments
Fries, 1997[192]. US	Before-after Pre-RAI, n=2128 Post-RAI, n=2088	***Pre-RAI implementation:*** No. participants with dehydration at baseline: 60 (3%) No. participants with dehydration at baseline remaining at the care home AND improved from baseline to 6 months: n=2 No. participants, dehydration absent at baseline remaining at the care home AND developed dehydration at 6 months: N/R	***Post RAI implementation:*** No. participants with dehydration at baseline: 22 (1%) No. participants with dehydration at baseline remaining at the care home AND improved from baseline to 6 months, n=4; OR, pre v post-RAI: 0.06 No. participants dehydration absent at baseline remaining at the care home AND developed dehydration at 6 months: N/R; OR pre v post-RAI: 1.08	0.01 0.01 0.82	Prevalence of dehydration differs between the text (3%) and Table 2 (2%). As prevalence is definitively described as n=60 (3%) in the text, this figure is reported in this review.
Holzapfel, 1997[118]. US	RCTc, n=39	***Mean fluid intake***: N/R	***Actual mean fluid intakes:*** N/R	0.53-1.00	Results presented as the t statistic and *p* value for between-group comparisons on days 1,5,10,15,20.
Kenkmann, 2010[108]. UK	Cluster CCT n=56	***Dehydration, n (%):*** Intervention: 5 (16); Control: 12 (46) ; *p*=0.02 (*p value calculated by reviewers)*	***Dehydration, n (%):*** Intervention: 3 (9); Control: 10 (39) RR of dehydration, intervention v control: 0.36 (95% CI: 0.06, 2.04)	0.25	Discrepancy between Table 3 & text. Numbers taken from text, as these correspond to reported RR of 0.36.
Lin, 2013[68]. Taiwan	Cluster CCT n=74	***Mean (SD) fluid intake, ml/day:*** Intervention: 1449 (421); Control: 1539 (565), p=0.44 ***USG, mean (SD's N/R):*** Intervention: 1.009; Control:1.012 (*p* value N/R)	***Mean (SD) fluid intake, ml/day:*** Intervention: 1732 (301); Control: 1548 (558) ***USG*** N/R	0.11	Post-intervention USG results N/R, but text stated that mean USG remained unchanged in both groups
McCormick, 2006[186,189]. Ireland	RCTc n=11	***Mean fluid intake:*** N/R	***Mean (SD) fluid intake:*** Thickened at bedside: 783 (165) Commercially-prepared, pre-thickened: 902 (271)	0.21	*p* value recalculated by reviewers (reported *p* value: 0.47). 8 (73%) participants increased fluid intake with commercially-prepared pre-thickened fluids

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Author	Study design	Outcome measures, baseline levels	Outcome measures, results	*p*	Comments
Mentes, 2000[178]. US	Cluster RCT n=49	***24 hour fluid intake, mls, mean (SD’s N/R***): Intervention: 1654; Control: 1888 (*p* value N/R) ***No. participants fluid intake >75% of fluid intake goal:*** Intervention: 19 (76%); Control: 22 (92%), *p*=0.25 ***Urine colour, mean (SD):*** Intervention: 25 (2); Control: 3 (1), *p*=0.12 ***USG, mean (SD):*** Intervention: 1.0159 (0.0041); Ctrl: 1.0195 (0.0038), *p*=0.002 ***TBW, %, mean (SD):*** Intervention: 55 (9); Control: 51 (6). *p*=0.14	***24 hour fluid intake, mls, mean (SD’s N/R***): Actual fluid intakes not reported. ***No. participants fluid intake >75% of fluid intake goal:*** Intervention: n=22 (88%); Control: n=20 (83%) ***Urine colour, mean (SD):*** Intervention: 2 (2); Control: 3 (2) ***USG, , mean (SD)::*** Intervention:1.0156 (0.0049); Control: 1.0164 (0.0045) ***TBW, %, mean (SD):*** Intervention: 54 (8); Control: 51 (7)	0.64 0.24 0.55 0.28	*p* values for post-intervention calculated by reviewers TBW: means, SD's & *p* values calculated by reviewers
Robinson, 2002[59]. US	Before-after n=51	***No. participants TBW lower than the standard, n (%):*** 24 (47) ***No. participants always drinking extra 16 floz/day:*** N/A	***No. participants TBW lower than the standard, n (%):*** 3 (6) ***No. participants always drinking extra 16 fl oz/day, n (%):*** 27 (53)	0.001 N/R	Mean TBW values reported graphically, but labelling unclear, so unable to ascertain figures. Text states that all 3 participants with TBW lower than the standard did not always drink the extra 16floz, had difficulty swallowing and needed help from the hydration assistant
Schnelle, 2010[60]. US	RCT n=112	***Between-meal fluid intake, fl oz/day, mean (SD):*** Intervention: 0.7 (0.2); Control: 0.7 (0.2), *p*=0.92	***Increase in between-meal fluid intake, fl oz/day, mean (SD):*** Intervention: +13.5 (6.5); Control: +1.9 (4.0)	<0.001	Text states meal-time fluid intake did not decrease, so increase seen between meals was a net gain.
Simmons, 2001[113]. US	RCT n=32	***Serum osmolality, mOsmol/kg, mean (SD):*** Intervention: 304 (9); Control: 303 (9), *p*=0.95 ***BUN:creatinine ratio, mean (SD):*** Intervention: 24 (5); Control: 22 (6), *p*=0.23	***Serum osmolality, mOsmol/kg, mean (SD):*** Intervention: 297 (11); Control: 295 (12) ***BUN:creatinine ratio, mean (SD):*** Intervention: 23 (6); Control: 24 (7)	0.57 0.71	*p* values calculated by reviewers. This study also assessed meal-time and between-meal fluid intake, but results not fully reported.

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Author	Study design	Outcome measures, baseline levels	Outcome measures, results	*p*	Comments
Spangler, 1984[114]. US	RCTc n=16	***USG ≥20, n (%):*** 4 (25)	***USG ≥20, n (%):*** 0 (0%) ***USG, mean (units N/R):*** Group A v B: Phase 1 (both groups, usual care): 20 v 18 Phase 2 (Group A, intervention): 14 v 18.5 Phase 3 (Group B, intervention): 17 v 13 Phase 4 (both groups, usual care): 17 v 16 Phase 5 (both groups, intervention): 14.5 v 14	<0.002	Mean urometer readings extracted from graph, SD's N/R. t test for repeated measures to compare groups A and B in phases 2 and 3, described as being significant, but only the *p* value was reported
Tanaka, 2009[115]. Japan	Before-after n=122	***Fluid intake, mls per day, mean (SD):*** 881 (264)	***Fluid intake, mls per day, mean (SD):*** 1146 (365)	<0.001	
Taylor, 2006[184]. Canada	RCTc n=31	N/A	***Meal-time fluid intake, mls, mean (SD):*** 3 meals/day: 612 (176); 5 meals/day: 698 (156) ***Meal-time fluid content of food, mls, mean (SD):*** 3 meals/day: 1116 (387); 5 meals/day: 1148 (330)	0.003 0.73	Text stated that fluids offered between-meals did not displace fluid consumption at meals. This data N/R.
Welch, 1996[180]. US	Before-after n=13	***Serum osmolality, mOsm/kg, mean (SD):*** 285 (2) ***BUN, mg/dl, mean (SD):*** 25 (3) ***Serum Na, mEq/l, mean (SD):*** 141 (1) ***Oral hydration fluid, water, other fluids, total fluid intake, mls, mean (SD):*** 0 (0), 397 (67), 1191 (166), 1588 (SD N/R)	***Serum osmolality, mOsm/kg, mean (SD):*** 279 (2) ***BUN, mg/dl, mean (SD):*** 22 (3) ***Serum Na, mEq/l, mean (SD):*** 139 (1) ***Oral hydration fluid, water, other fluids, total fluid intake, mls, mean (SD):*** 131 (88), 420 (10), 1131 (126), 1682 (SD N/R)	<0.001 0.002 <0.001	*p* values calculated by reviewers.

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Author	Study design	Outcome measures, baseline levels	Outcome measures, results	*p*	Comments
Willms, 2003[111]. Germany	Before-after n=70	***Fluid intake, ml/day, mean (SD):*** 956 (413)	***Fluid intake, mls, mean (SD):*** 1325 (373)	<0.001	*2 residents not available for baseline assessment, n=68*
Zembrzuski 2006[181]. USA	CCT n=82	***Fluid intake, mls: mean (SD):*** Intervention: 1078 (183); Control: 1118 (285), *p*=0.47	***Fluid intake, mls: mean (SD):*** Intervention: 1577 (66); Control: 1063 (274)	<0.001	*p* value calculated by reviewers.

**taken from paper by Bunn, 2015[187]*

5.4.3.1 Drinking vessel characteristics

An RCT involving UK hospital patients and nursing home residents with cognitive impairment investigated whether the method of serving oral nutritional supplements (ONS) would influence the amount of ONS consumed[185,188]. ONS was either served in the original bottle with a straw (control group), or decanted into a glass (intervention group) over three non-consecutive days during one week. Findings for 24 care home residents were reported separately in a conference abstract[188] (but not in the published paper), and without commenting on the distribution of the data, the eight residents randomly selected to receive ONS in the original bottle with a straw were described as consuming 62% (SD: 40%) compared to the 16 residents who received the ONS in a glass who consumed 81% (SD: 29%), p=0.002, although on rechecking, we found p=0.23. Given that the SD for the control group exceeded one-half of the mean, data were likely to be non-normally distributed, so median and IQR may have been more appropriate statistics to describe the findings.

Dunne[176] assessed the effect on fluid intake of high and low-contrast coloured tableware, compared to white, at lunch and supper for 10 days in two separate studies (a year apart) using a before-after study design. Each involved nine men with advanced dementia living in a US long-term care unit. Fluids were weighed and amounts consumed expressed as a percentage of amount served. In study 1, using high-contrast red tableware, the proportion drunk increased from a baseline mean of 54% (SD: 37%) to 88% (SD: 22%) with a reported p=0.001, but on rechecking we found p=0.02. Although parametric statistical tests were used to describe the data, non-parametric tests may have been more appropriate as the baseline SD exceeded one-half of the mean. In Study 2, nine participants (including five from Study 1), had the colours of their tableware manipulated as follows: white, high-contrast blue, white, low-contrast red, white, low-contrast blue, white, for 10 days each. Six participants completed the study. There were no statistically significant differences in mean fluid intake for any of the three colours when compared to white tableware in the period immediately prior to it (p=0.26, 1.0, 0.88 respectively).

These studies by Allen and Dunne were both small and only assessed fluid intake at particular timepoints rather than over 24-hour periods (see section 5.5).

5.4.3.2 Drink characteristics

In Ireland, a crossover RCT involving 11 long-term care residents with dysphagia, compared fluid intake using commercially-prepared pre-thickened drinks with drinks thickened by staff at the bed-side[186]. During each six week intervention period, fluid intake, which was assessed at each drinking occasion, did not differ significantly (pre-thickened drinks, mean intake: 902ml, SD: 271; drinks thickened by staff, mean intake: 783ml, SD: 165, $p=0.21$). Constipation rates were reported as not significantly different between groups (Table 5-5).

A US cross-sectional study (Reed[179]) with 326 participants living in 35 assisted-living facilities and 10 nursing homes, investigated the relationship between thickened drinks and low fluid intake (defined as ≤8 fluid ounces at a single meal, method of assessment not described). Adjusting for age, sex, ethnicity, marital status, number of comorbidities, cognitive status and activities of daily living, there was no evidence that receiving thickened drinks, compared to non-thickened drinks, was associated with low fluid intake (OR 1.02, 95%CI: 0.38, 2.75). However, this study was considered to be at high risk of bias as there was no description of how fluid intake was assessed or why an intake of <8 fluid ounces at a single meal was considered to be a marker of poor fluid intake.

*__Table 5-5: Before-after and crossover intervention studies reporting secondary outcomes*__*

Study details	Secondary outcome	Pre-intervention levels for secondary outcomes	Post-intervention levels for secondary outcomes	*p*
McCormick, 2006[186,189]. Ireland	Number of participants constipated, n (%)	***n=11*** N/R	***n=11*** Rates of constipation N/R, but described as not being significantly different.	
Robinson, 2002[59]. US		***n=51***	*Results reported descriptively*	
	Number of falls	Unit of measurement and baseline rates not reported	Decline in number of falls	0.05
	Number of UTI's		Fewer observed UTI's	ns
	Number of URTI's		Fewer observed URTI's	ns
	Skin breakdown, number of occurrences		Fewer observed occurrences of skin breakdown	ns
	Number of bowel movements		Number of bowel movements increased	0.04
	Laxative use		Reduction in laxative use	0.05
	Episodes of mental status changes:		Episodes of mental status, changes not reported	

**taken from paper by Bunn, 2015*[187]

5.4.3.3 Physical and social setting for drinking

Adjustments to the eating and drinking environment may alter fluid intake. A clustered controlled clinical trial (CCT) involving six UK care homes evaluated a planned programme of developments to improve the physical and social environment at mealtimes as well as increasing the availability and choice of drinks[108]. Risk of dehydration (defined as the presence or absence of a dry furrowed tongue, dry mucous membrane and/or sunken eyes) was unaltered by the intervention (RR: 0.36; 95%CI: 0.06, 2.04, p=0.25) in the 56 participants who completed the 1-year follow-up, although it should be noted that the clinical signs of dehydration used in this study to assess outcome have since been shown to be ineffective in this population and so the study was judged to be at high risk of bias on this criterion (see Hooper et al[97] and Chapter 4:. Secondary outcomes are reported in Table 5-6.

Reed[179] assessed the association of environmental factors with low fluid intake. The odds of a low fluid intake were lower for participants eating in the dining room compared to their bedrooms (OR: 0.18; 95%CI: 0.06, 0.63). Participants taking meals in dining rooms with fewer institutional features had lower odds of low fluid intake compared to participants eating in more institutionalised settings (OR: 0.65; 95%CI: 0.55, 0.77). The odds of low fluid intake were not affected by number of residents in the dining area (OR: 1.03; 95%CI: 0.93, 1.15); presence of family members (OR: 1.22; 95%CI: 0.46, 3.2) or noise level (OR: 0.92; 95%CI: 0.44, 1.89).

A Canadian study with just three participants in a long-term care facility used a before-after design to investigate whether a set seating plan at lunchtime would improve food and fluid intake[182]. Mean fluid intake during non-intervention periods for participants 1, 2 and 3 were: 27%, 87% and 74%, respectively. Mean fluid intake during post intervention periods for the same three participants was: 48%, 90% and 96% respectively, an overall mean increase of 15% (p=0.53) for all three participants. However, the study duration and whether the seating plan was maintained for meals other than those observed was not reported and fluid intake was assessed as percentage consumed of the amount served at lunchtime only, but amounts served and method of assessment were not described.

*Table 5-6: Controlled intervention studies reporting secondary outcomes**

Study details	Secondary outcome	Baseline levels of secondary outcomes			Findings for secondary outcomes		
		Intervention group	**Control group**	***p***	**Intervention group**	**Control group**	***p***
Kenkmann, 2010[108]. UK		***n=57***	***n=48***				
	Falls, number of residents falling in previous 12 months, n (%)	34 (60)	27 (56)	0.73†	34 (60)	24 (50)	0.23†
	BMI, mean (SD)	26 (5)	25 (5), n=43	0.28†	26 (5)	24 (5), n=43	0.18†
	MMSE, mean (SD)	19 (6), n=30	17 (6), n=26	0.21†	17 (6)	15 (8)	0.3†
	UTIs, number of residents with UTI in previous 12 months, n (%)	21 (37)	20 (42)	0.61†	20 (35)	12 (25)	0.27†
	URT's, number of residents with URTI in previous 12 months, n (%)	20 (35)	10 (21)	0.11†	16 (28)	22 (46)	0.06†
	Anaemia (Hb <12g/dl), n (%)	5 (39), n=13	2 (29), n=7	0.66†	6 (46)	4 (57)	0.63†
Lin, 2013[68]. Taiwan		***n=44***	***n=30***				
	Number of participants with asymptomatic bacteriuria (ASB), n (%)	17 (39)	5 (17)	0.04	10 (23)	3 (10)	0.22
Mentes, 2000[178]. US		***n=25***	***n=24***				
	Acute confusion, number of events, n (%)	Baseline rates N/R	Baseline rates N/R		0	2 (8)	
	UTI, number of events, n (%)				0	2 (8)	
	URTI, number of events, n (%)				0	2 (8)	
	Pneumonia, number of events, (%)				1 (4)	1 (4)	
	Influenza, number of events, n (%)				2 (8)	0	
	History of infections, n (%) *(time period over which infections occurred N/R)*	9 (36)	2 (8)	0.02	RR (95%CI) for *all* HLEs combined: 0.48 (0.18, 1.26).		
Schnelle, 2010[60]. US		***n=58***	***n=54***				
	Constipation, number of participants, n (%)	45 (78)	44 (82)	0.61	30 (52)	51 (94)	<0.001

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Study details	**Secondary outcome**	**Baseline levels of secondary outcomes**			**Findings for secondary outcomes**		
		Intervention group	**Control group**	***p***	**Intervention group**	**Control group**	***p***
Zembrzuski, 2006[181]. US		***n=48***	***n=34***				
	Number of residents falling in previous 30 days, n (%)	13 (27)	3 (9)	0.05[†]	3 (6)	6 (18)	0.12[†]
	SBP, mean (SD) difference between 3 readings of supine and 3 readings of upright BP	11 (6)	7 (5)	0.003[†]	1 (7)	8 (8)	0.003[†]
	DBP, mean (SD) difference between 3 readings of supine and 3 readings of upright BP	4 (6)	3 (3)	0.16[†]	-2 (5)	3 (6)	0.0002[†]

*taken from paper by Bunn, 2015[187]

[†] *p* values calculated by reviewers

5.4.3.4 Institutional factors

Four studies[49,177,179,183] investigated institutional factors: type of ownership and management, size of facility, staffing levels and monitoring systems. Three studies were observational[49,179,183], and two of these were secondary analyses of state-wide datasets[49,183], large robust studies with good internal validity.

5.4.3.5 Resident Assessment Instrument Minimum Data Set (RAI-MDS)

A large US study investigated the effect of the compulsory implementation of the RAI-MDS during 1990-1 using a before-after design[177]. Two separate cohorts were recruited from >250 nursing homes across 10 states in 1990 (n=2128) and 1993 (n=2088) to assess whether implementation affected prevalence of dehydration at baseline and whether this was more or less likely to improve after 6-months follow-up. The odds of dehydration at baseline were significantly reduced following implementation of the RAI-MDS, compared to before (3% to 1%, p=0.01; OR: 0.35, 95%CI: 0.21, 0.57)[3]. However, for participants found to have dehydration at baseline, the odds of improving at the 6-month follow-up were decreased following RAI implementation (OR: 0.06, p=0.008) although the actual numbers of participants who remained in the study at 6 months were small (n=2 and n=4 for improvement pre/post implementation respectively).

5.4.3.6 Staffing

The relationships between staffing and dehydration were investigated in two US cross-sectional studies[49,179]. A secondary analysis using databases of the RAI-MDS and Online Survey Certification and Reporting (OSCAR, information regarding nursing homes, size, location, staffing, ownership), evaluated relationships between staffing and dehydration in 363,895 residents across 2951 nursing homes in six states. Dehydration was defined using a combination of RAI-MDS criteria and ICD-9 code for dehydration (E276.5). Adjusting for resident characteristics, stepwise logistic regression and generalized additive models explored linear and non-linear relationships respectively. There was no

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[3] *The prevalence of dehydration differs between the text and Table 2 in the paper by Fries et al. As prevalence is definitively described as n=60 (3%) in the text, this figure is reported in this review.*

evidence that staff grade or number of staffing hours had any influence on residents' dehydration levels, though the referent is unclear (Table 5-7).

In the US, Reed[179], after adjusting for several resident characteristics, found that the odds of a resident having a lower fluid intake were slightly reduced with low resident/staff ratios, although the number of staff (whether supervisory or direct-care) trained to detect and treat nutritional problems had no impact on fluid intake (Table 5-7), although the outcome measure used in this study was judged high risk of bias (Figure 5-2).

5.4.3.7 Ownership and type of facility

Ownership was examined in three observational studies[49,179,183] (Table 5-7). Macgregor[183], conducting a retrospective cohort study, using the Canadian British Columbia Linked Health Database (includes administrative records for all publicly-funded health care services use and vital statistics for residents) investigated the influence of facility type and ownership on hospital admissions for dehydration amongst the 43,065 individuals admitted from long-term care facilities between April 1996 and August 1999. Rates of hospital admission with dehydration were greater from for-profit facilities compared with not-for-profit facilities after adjusting for age, sex, level of care, facility size and hospitalisation in the previous 30 days[183].

Of the two US studies, Dyck[49] found no difference in dehydration prevalence (after adjusting for 'internal resident characteristics') and the smaller study by Reed[179], using an outcome measure with a high risk of bias, found that residents from for-profit facilities had lower odds of a low fluid intake compared to residents living in not-for-profit facilities. All three studies conducted sub-group analyses to investigate associations between different types of for-profit and not-for-profit facilities (Table 5-7).

5.4.3.8 Size and location of facility

Neither McGregor[183] or Reed[179] found that size of facility had an effect on the dependant variable, although their definitions of 'large' and 'small' facilities differed (Table 5-7). Dyck, investigating geographical location, found marginally non-significant lower odds of dehydration in rural facilities (OR: 0.9; 95%CI: 0.81,1.0; *p*=0.06)[49].

*Table 5-7: Institutional factors and their association with dehydration or low fluid intake**

Study details	Characteristic	Referent / comparison	Measure of dehydration or low fluid intake	OR/RR (95%CI)	Significant effect?
Staffing					
Dyck, 2006[49,191]. US	Grade of nurse:		RAI-MDS record of dehydration, using MJ1c code or ICD-9 code E276.5		
	Registered Nurse, hours per resident per day	Unclear		OR: 1.07 (0.82, 1.39)[#]	N
	Licensed Practical Nurse, hours per resident per day	Unclear		OR: 1.20 (0.97, 1.48)[#]	N
	Certified Nursing Assistant, hours per resident per day	Unclear		OR: 0.95 (0.85, 1.06)[#]	N
Reed, 2006[179]. US	Number of staff trained to detect and treat nutritional problems (Nb 'some' not defined by authors):		Fluid intake ≤8floz observed over a single meal		
	≥75% of supervisory staff	None in the facility		OR: 1.02 (0.89, 1.16)[†]	N
	'some' supervisory staff	None in the facility		OR: 1.01 (0.94, 1.08)[†]	N
	≥75% direct-care staff	None in the facility		OR: 0.99 (0.87, 1.14)[†]	N
	'some' direct-care staff	None in the facility		OR: 0.99 (0.93, 1.07)[†]	N
	Lower numbers of residents per staff member	Higher number of residents per staff member		OR: 0.95 (0.91, 0.99)[†]	Y
Ownership and type of facility					
Dyck,2006[49,191]. US	Chain facilities	Non-chain facilities	RAI-MDS record of dehydration, using MJ1c code or ICD-9 code E276.5	OR: 0.86 (0.77, 0.96)[#]	Y
	Not-for-profit facilities	For-profit facilities		OR: 1.02 (0.91, 1.15)[#]	N
McGregor, 2005[183]. Canada	For-profit facilities	Not-for-profit facilities	Hospital admission due to dehydration, using ICD-9 code E276.5	RR: 1.24 (1.08, 1.43)[‡]	Y
	For-profit sub-groups:				
	Chain facilities	For-profit multi-site facilities		RR: 0.93 (0.69, 1.26)[‡]	N
	Chain facilities	For-profit single-site facilities		RR: 1.04 (0.74, 1.45)[‡]	N
	Multi-site facilities	For-profit single-site facilities		RR: 1.10 (0.84, 1.45)[‡]	N

(continued on next page)

Study details	Characteristic	Referent / comparison	Measure of dehydration or low fluid intake	OR/RR (95%CI)	Significant effect?
	Not-for-profit sub-groups:				
	Amalgamated to health authority	Facility attached to hospital		RR: 1.53 (1.18, 1.96)‡	Y
	Single-site facilities	Facility attached to hospital		RR: 2.29 (1.83, 2.88)‡	Y
	Multi-site facilities	Facility attached to hospital		RR: 1.40 (1.01, 1.94)‡	Y
	Single-site facilities	Amalgamated to health authority		RR: 1.49 (1.21, 1.84)‡	Y
	Multi-site facilities	Amalgamated to health authority		RR: 0.91 (0.66, 1.26)‡	N
	Single-site facilities	Multi-site facility		RR: 1.63 (1.23, 2.17)‡	Y
Reed, 2006[179]. US	For profit facilities	Not-for-profit facilities	Fluid intake ≤8floz observed over a single meal	OR: 0.34 (0.22, 0.53)†	Y
	Residential care or ‘traditional’ type of assisted living facilities	Nursing homes		OR: 0.83 (0.44, 1.55)†	N
	Residential care or ‘new model’ type of assisted living facilities (residents require more care, including nursing care)	Nursing homes		OR: 0.46 (0.27, 0.79)†	Y
Size and location of facility					
Dyck, 2006[49,191]. US	Rural facilities	Urban facilities	RAI-MDS record of dehydration, using MJ1c code or ICD-9 code E276.5	OR: 0.90 (0.81, 1.00), p=0.06*	N
McGregor, 2005[183]. Canada	Large facilities *(defined by authors),* >71.5 beds	Small facilities, ≤71 beds	Hospital admission due to dehydration, using ICD-9 code E276.5	RR: 0.95 (0.82, 1.10)‡	N
Reed, 2005[179]. US	Small facilities*(defined by authors)*, >16 beds	Nursing homes	Fluid intake ≤8floz observed over a single meal	OR: 1.08 (0.48, 2.45)†	N

***taken from paper by Bunn, 2015*[187]

**Adjusted for internal resident characteristics.*

†Adjusted for age, sex, ethnicity, marital status, number of comorbidities, cognitive status and activities of daily living.

‡Adjusted for age, sex, level of care, facility size and hospitalization in the 30 days prior to date used in the study.

5.4.3.9 Care aimed at increasing fluid intake

Ten studies investigated a range of factors specifically aimed at increasing fluid intake or decreasing dehydration. Four investigated single interventions[68,118,180,184], and six were multi-component interventions[52,59,111,175,178,181].

The effect of a feeding assistant's position (sitting or standing) was investigated in a US nursing home crossover RCT[118]. Thirty-nine residents were randomised to either a 'control' group (feeding assistants chose their position) or one of two intervention groups where residents were fed one way for two weeks, then crossed over and fed the other way for two weeks. Results were reported as the *t* statistic and *p* value between each group (sitting/standing, choice of feeder/sitting, choice of feeder/standing) for days 1,5,10,15 and 20 of the 4-week study. Comparing sitting with standing groups only (as control group feeder positions were not reported), the feeding assistant's position had no significant effect on fluid intake (*p* values ranged from 0.53-1.0).

A six week non-randomised cluster CCT involving 74 residents in six nursing homes investigated whether advice to increase fluid intake would reduce rates of asymptomatic bacteriuria[68]. The method of fluid intake assessment and nature of advice provided were not described, except that the choice of drinks was unlimited and fluid intake should exceed 1500ml/day. On completion there was no significant difference in mean fluid intake between intervention and control groups (intervention group: 1732ml/day, SD: 301 vs control group: 1548ml/day, SD: 558; p=0.11), or rates of asymptomatic bacteriuria (Table 5-6).

Taylor[184] investigated the effect of three or five meals per day on energy and fluid intake in a crossover RCT involving 31 residents with dysphagia living in a Canadian extended care facility. Using a well-described method of fluid ascertainment at mealtimes, but relying on facility staff to record intake at other times, mean mealtime fluid intake was reported as increasing significantly (612ml/day, SD: 176, to 698ml/day, SD:156; p=0.003*)* with no decrease in between-meal fluid intake noted (but actual amounts not reported).

Welch[180] investigated how 13 mildly dehydrated US nursing home residents responded to an oral hydration solution in a five day study using a before-after design. Significant improvements were observed in serum osmolality (reported as decreasing from a baseline mean of 285mOsm/kg, SD: 2, to 279mOsm/kg, SD: 2, p<0.001) and blood urea nitrogen (BUN, baseline mean 25mg/dl, SD: 3, decreasing to 22mg/dl, SD: 3, *p*=0.002), but not mean fluid intake (baseline: 1588ml/day, day 5: 1682ml/day; SDs not reported).

The following three studies used BIA to assess dehydration. BIA is a measure of total body water and its use as a measure of water-loss dehydration in older people is questionable[97]. Further, BIA assessments are prone to measurement error, so full details of how the assessments are conducted together with reports of intra- and interrater variability are required to fully assess risk of bias.

Using a before-after design, Allison[175] described a management program where senior staff from 26 US long-term care facilities evaluated 281 participants to assess whether a baseline BIA assessment of TBR >550ohms indicated dehydration. Staff were instructed to intervene with appropriate care (not described) following the BIA assessment. After 3-4 months there was no clear effect on dehydration, reported as a fall in TBR in 70% of participants (610ohms, SD: 37, at baseline to 478ohms, SD: 60), but with no effect in 30% of participants where they suggested that the intervention was not applied consistently (data not reported by study authors). The study authors did not report on the methods used to conduct the BIA assessments or on any interrater assessments to judge the degree of measurement error.

Mentes[178], in a cluster RCT involving 49 participants from four US nursing homes, investigated the effect of an eight-week hydration programme (increased choice and availability of drinks, staff training, identification of 'at risk' residents and calculation of individual weight-based fluid goal) on reducing hydration-linked events. Significant baseline differences between intervention and control groups in functional ability (*p*<0.001), confusion levels (*p*=0.003) and USG (*p*=0.002) were not adjusted for due to the small sample size, introducing bias. Methods for assessing fluid intake were not described, and mean fluid intakes following intervention were not reported, although the number of participants drinking >75% of their fluid intake goal were described as not being significantly different following the intervention (22, 88%, intervention group vs 20, 83%, control group, *p*=0.64). There were no significant differences between groups on USG (*p*=0.55), urine colour (*p*=0.24), BIA assessment of TBW (*p*=0.28) or hydration-linked events (Table 5-4).

Robinson[59] included 51 US nursing-home residents to investigate the effectiveness of a five-week hydration programme (increased availability and choice of drinks, presented more attractively) aiming to increase fluid intake by 16 fluid ounces/day, to reduce dehydration and six related conditions (Table 5-4). Using a before-after design, research staff measured fluid intake at mid-morning and mid-afternoon drinks rounds and conducted weekly BIA assessments of TBW (methods not reported). Following the intervention, 27 (53%) residents always drank the extra 16 fluid ounces/day of fluid provided. Mean TBW data were poorly reported but the number of participants with TBW below the 'standard' (not defined) dropped from 24 (47%) to 3 (6%), p=0.001. Falls (p=0.05), laxative use (p=0.05), and number of bowel movements (p=0.04) improved significantly but urinary tract infections, upper respiratory tract infections and skin breakdown demonstrated non-significant improvements (p>0.05). Mental status changes were assessed but not reported (Table 5-5).

In another study using a before-after design, Willms investigated the effects of a multi-component intervention (education for staff and residents, increased help and provision of drinks) to improve fluid intake for 70 participants living in a German nursing-home[111]. Nursing staff used calibrated containers to assess fluid intake and mean fluid intake was reported as increasing significantly (from 956ml/day, SD: 413, to 1325ml/day, SD: 373; p< 0.001), although the time period over which fluid intake was assessed was not reported.

In the US, a CCT with 82 participants based in four skilled nursing home facilities, evaluated the effect of a multi-component intervention (increased help and provision of drinks, closer monitoring of fluid intake) to increase fluid intake on postural hypotension and falls over 30 days[181]. Research staff assessed all fluid intake for 12 hours over three consecutive days at baseline and on completion using graduated cups. Mean fluid intakes for the intervention group were significantly higher than the control group (1577ml/day, SD: 66, vs 1063ml/day, SD: 274; p< 0.001).

Mean difference in both systolic and diastolic blood pressure from lying to standing, improved significantly in the intervention group compared to the control group, but the number of participants falling was not significantly different between the two groups (Table 5-6).

A cross-sectional study in three US nursing homes with 99 participants investigated factors associated with inadequate water intake[52]. Food and fluid intake was observed over two 24-hour periods during one week, with low water intake (from food and drinks) defined as ≤1600mls/m^2 body surface area. Unable to adjust for confounders (age, sex, frailty) due to small sample size, and considering the modifiable factors only (positioning of the resident's upper body, place of ingestion, number of ingestion sessions and who initiated the ingestion), fewer ingestion sessions were correlated with inadequate water intake, r=0.32, *p*<0.01, but associations between water intake and positioning, place of ingestion and who initiated the ingestion were not reported.

5.4.3.10 Care aiming to increase fluid intake, including toilet–care assistance

Four studies, recognising the impact that anxieties about micturition may have on fluid intake, included increased toileting assistance within multi-component interventions[60,113–115].

Schnelle[60] included 112 US nursing home residents in a 12-week RCT comparing usual care with an intervention where residents were prompted to void, exercise, and increase food and fluid intake two hourly (7.00am–3.30pm) by research staff who also checked for incontinence and offered appropriate toileting assistance and choice of drinks. Assessing the amount imbibed as a proportion of amount served, meal and between-meal fluid intake was recorded over two consecutive days at baseline and each month of the intervention. Only the results of between-meal fluid intake were reported (mean change from baseline, intervention group: +14 fluid ounces/day, SD: 6; control group: +2 fluid ounces/day, SD: 4; *p*<0.001), but they stated that there was no decrease in mealtime fluid intake. Constipation rates improved significantly (*p*<0.001, Table 5-6).

Simmons[113] involved 32 residents from two US nursing homes in a 32-week RCT to increase fluid intake. Usual care was compared to the intervention, delivered in three phases. In weeks 1-16 residents were prompted to exercise every two hours (7.00am–3.30pm) by research staff who checked for incontinence, offered toileting assistance and drinks. This increased to eight prompts a day in weeks 17-24, and in weeks 25-32 this was supplemented by an increased choice of drinks. Serum osmolality and BUN:creatinine ratio were assessed at baseline and 32 weeks. No significant differences were observed between groups following intervention, although both groups improved significantly compared to baseline (mean baseline serum osmolality, intervention group: 304, SD: 9, vs 303, SD: 9, control group, *p*=0.95; 32-week mean serum osmolality, intervention group: 297, SD: 11, vs 295, SD: 12, control group, *p*=0.57; mean baseline BUN/creatinine ratio, intervention group: 24, SD: 5, vs 22, SD: 6, control group, *p*=0.23; 32-week mean BUN:creatinine ratio, intervention group: 23, SD: 6, vs 24, SD: 7, control group: *p*=0.71). This study also assessed meal and between-meal fluid intake but these data were not fully reported.

In an earlier US study[114] 16 non-ambulatory nursing-home residents were enrolled onto a seven-week crossover RCT, to investigate whether increased help and availability with drinks, incontinence and toileting care would decrease dehydration, assessed using USG (measured using a urinometer, dehydration defined as USG ≥22, units not described). After a baseline period when all residents received standard care (phase 1), residents were matched for dehydration and continence levels, then randomly assigned to one of two groups (A and B). The crossover periods were phases 2 and 3, when the intervention was delivered by research staff; phase 4 was a return to baseline and in phase 5 the facility staff administered the intervention. *t* test for repeated measures were described as statistically significant (p=0.002) between Groups A and B for phases two and three.

A more recent study utilising a before-after design based in 17 Japanese nursing homes with 122 participants, instituted a 12-week intervention (increased feeding assistance and availability of drinks, increased help with incontinence and toileting care, increased time out of bed). Fluid intake (assessed by facility staff, methods not reported) increased significantly (mean fluid intake, baseline, 881ml/day, SD: 264; post intervention, 1146ml/day, SD: 365, p<0.001)[115].

5.5 Discussion

Nineteen intervention and four observational studies from seven countries were included in this review. In intervention studies, six of the nine multi-component interventions demonstrated a trend towards increasing fluid intake, particularly if they included increased choice and availability of drinks, staff awareness, and increased assistance with drinking and toileting. A reduction in dehydration prevalence was observed following the compulsory implementation of the Resident Assessment Instrument (RAI) in the US in 1990-1[177]. The RAI is a comprehensive standardized tool designed to assess residents living in long-term care and to provide individualized care to promote functioning and prevent avoidable problems but using standard care packages. Two small studies, both using before-after designs, reported positive findings. Dunne reported an increase in fluid intake in nine men with Alzheimer's Disease when using high-contrast red cups compared to white, although these findings were not repeated when using low-contrast red or high and low-contrast blue in a second cohort of nine men recruited twelve months later[176]. Welch provided oral hydration fluids to thirteen mildly dehydrated nursing home residents over five days resulting in improved serum biochemical indices[180]. Advice to residents, modifications to the dining environment and the way in which drinks were served (straw vs beaker[185,188]; pre-thickened drinks vs those thickened at the bedside[186,189]) were inconclusive. Two large observational studies with good internal validity investigated effects of ownership; in Canada, for-profit ownership was associated with increased hospital admissions for dehydration[183] and in the US, no difference was seen in dehydration prevalence between for-profit and not-for-profit homes, although chain facilities were associated with lower odds of dehydration[49]. This study did not suggest any effect for staffing levels (grade of staff or staffing hours/day) on dehydration prevalence.

In contrast to the previous review[91], we included observational studies and controlled clinical trials as well as RCTs but we confined our review to residents living in long-term care settings only, aiming to identify strategies applicable to these particular settings. Older people living in the community are generally more independent and not so reliant on carers to provide drinks and assistance, whereas patients in acute hospitals face very different issues related to the cause of the admission and the acute illness. Even so, we identified 21 more studies than previously, and so identified many more interventions and exposures. The inclusion of observational studies enabled us to describe the effect of environmental and institutional factors, which had not been recognised previously.

Despite confining this review to long-term care settings, we still found that there was great heterogeneity amongst study authors about how this was defined. In part, this is due the way that care provision for older people with care needs has changed over time, but there are also local and national differences in the types of care that are available. We included all types of care provision if they were described in terms of providing long-term care, whatever the kinds of care needs required by residents. We took a broad view of ‘long-term’ care to ensure that any findings were as generalizable as possible, but given the poor methodological quality of most of the studies, as well as the high risk of bias, reported findings have to be interpreted with care, with the efficacy of many strategies remaining unproven.

Of particular concern was the lack of valid outcome measures of fluid intake and dehydration, validated in older people. We found that definitions of ‘fluids’ varied: some studies defined fluids as those existing as liquids at room temperature, some only considered fluids if they were drunk and in others it was considered to be the water content of any fluids or foods imbibed. Similarly, different methods of assessing fluid intake were used, including use of graduated cups, weighing and estimating the proportion drunk from the amount served (but amount served was often not described). The period of time over which fluid intake was measured also varied, with fluid intake being measured at the point of intervention or at certain times of the day. Unless 24-hour fluid intake is recorded, evidence demonstrating that overall fluid intake has altered cannot be determined – it may simply increase at one time period at the expense of another.

Lack of blinding was a source of high risk of bias in all the studies, and whilst blinding at the level of intervention delivery is challenging, if possible at all, improved study designs, perhaps involving three arms (‘usual care’, intervention and modified intervention) and more rigorous blinding of personnel at the different stages (random sequence generation, allocation, outcome assessment and statistical analysis) may resolve some of the biases identified in this review.

5.5.1 Meta-analysis

The original plan for this systematic review was to include a random-effects meta-analysis, sensitivity analysis and an assessment of publication bias if there was sufficient homogeneity of study design and study outcomes. In this review, heterogeneity was too great for meta-analysis to be considered, as we included six types of study design (RCT, CCT, before-after, controlled cross-over, retrospective cohort and cross-sectional) and within these there was further heterogeneity, with three studies being cluster controlled trials (one RCT, two CCTs). The mix of interventions and associations, and outcome measures used to assess effectiveness or association were such that no two studies investigating the same intervention or association reported with the same outcome measure. Finally, the risk of bias was too great for any meta-analysis to be considered robust.

5.5.2 Secondary outcomes

We investigated the effect of dehydration and/or low fluid intake on secondary outcomes where a possible link had been reported (Table 5-5, Table 5-6). The reported effects of dehydration or poor fluid intake on secondary outcomes is only relevant in those studies where there was a clear effect of the intervention together with a low risk of bias. In the seven intervention studies reporting on secondary outcomes[59,60,68,108,178,181,186,189], all demonstrated considerable risk of bias on the Cochrane Risk of Bias Tool, or the risk was unclear (Figure 5-2), so the findings from all these studies (whether or not they demonstrated an effective reduction in dehydration or increase in fluid intake and/or reduction in secondary outcomes) should be interpreted with care and not viewed as providing supporting evidence to establish causal links between dehydration and/or poor fluid intake and secondary outcomes. Further work is still required in this area.

5.6 Publications arising from Chapter 5

Five publications, including the full paper, have arisen from the systematic review, and I was lead author on all of them, as described in section 5.1.

(i) Bunn, DK, Jimoh, F, Howard Wilsher, S, Hooper, L. Increasing fluid intake and reducing dehydration risk in older people living in long-term care: a systematic review. Journal of the American Medical Directors Association. 2015. 16:101-5

(ii) Bunn D, Jimoh F, Howard Wilsher S, Hooper L. Effectiveness of factors to reduce the risk of dehydration in older people living in residential care: a systematic review. 2014. Oral presentation. 10th International Congress of the European Union Geriatric Medicine Society, Rotterdam, Netherlands. European Geriatric Medicine. (Abstract Suppl); 5:s70 (03.21).

(iii) Bunn D, Jimoh F, Wilsher S, Hooper L. Effectiveness of external factors to reduce the risk of dehydration in older people living in residential care: a systematic review. BMC Health Services Research conference, London. BMC Health Services Research, 2014. 14(suppl 2):P11.

(iv) Bunn DK, Jimoh F, Howard Wilsher S, Hooper, L. Effectiveness of external factors to reduce dehydration risk in older people living in residential care: a systematic review. Nutrition Society Summer Conference. Proceedings of the Nutrition Society. 2013. 72:(OCE4), E277.

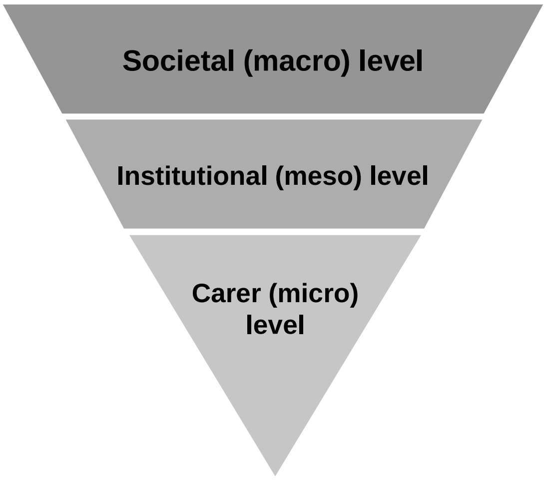
(v) Bunn D, Hooper L. Effectiveness of external factors to reduce the risk of dehydration in older people living in residential care: a systematic review (protocol). http://www.crd.york.ac.uk/prospero/.

5.7 Summary and conclusions from Chapter 5

Future studies should consider how best to assess outcomes using validated methods. If assessing dehydration, serum or plasma osmolality should be used, or the Khajuria formula for calculated serum osmolarity calculated from routine biochemical parameters, which is a valid substitute for serum osmolality and thus a useful screening tool for dehydration which may be useful in both intervention and cohort studies where residents are undergoing routine blood tests, as long as these blood tests include estimations of urea, sodium, potassium and glucose[86].

Whilst this systematic review has been unable to conclusively demonstrate the effectiveness of many strategies or associations to prevent dehydration and/or increase fluid intake due to the high risk of bias, we found a range of strategies described at the societal ('macro'), institutional ('meso') and carer ('micro') levels (Figure 5-3), indicating that further investigations into dehydration prevention should be undertaken at each of these levels. Further investigations of promising interventions at the carer and institutional level using high-quality adequately powered RCTs with valid outcome measures are required. Of particular concern was the lack of interventions to identify and target personal barriers to drinking, thus promoting person-centred care[193].

Figure 5-3: Levels at which to direct interventions



In the UK we lack the kinds of national databases and reporting systems found in the US and Canada which enable the impact of policies and other macro factors on care provision and outcomes to be examined. And whilst such a major undertaking would take many years to develop, on a smaller scale the establishment of robust cohort studies investigating the multi-factorial effects of such factors as national policies, home ownership, staffing levels and training on health outcomes are required and would be a major step forward in increasing our understanding of many health outcomes, including dehydration. In these circumstances, when considering the complexity of causal chains in public health, which are likely to be multi-factorial in nature, RCTs may not be the most appropriate study design because of the way in which clearly defined interventions are implemented in controlled circumstances[194].

Many study authors in this systematic review commented on the challenges of conducting research in care home environments, a finding echoed by many researchers working in care homes[195], and one we can identify with through our work with DRIE. Thus adequate research support is a key challenge and needs to be addressed when considering how to develop high-quality research in nursing homes[195], and the development of the ENRICH (Enabling Research in Care Homes)[196] network, under the umbrella of the NIHR (National Institute of Health Research) is likely to prove beneficial.

Whilst this chapter reviewed the way in which researchers investigated different interventions and associations aiming to improve fluid intake and/or prevent dehydration, the following chapter takes a different approach, by exploring issues relating to hydration care in care homes from the perspectives of residents and their carers to provide insights from their emic perspectives.

Chapter 6: Qualitative Study

6.1 Contributions

As chief investigator, I designed the study and wrote the protocol. I submitted the ethics application, attended the ethics meeting and dealt with queries and ongoing correspondence. I recruited all care homes and participants and facilitated all the focus groups. I assembled and worked with a group of co-facilitators and duplicate coders, supervised the transcriber, conducted the analyses and reported the findings. I have written this chapter.

6.2 Aim and introduction to Chapter 6

The aim of this study was to explore the views and experiences of residents, families and staff to understand issues which may help and/or hinder residents to drink well, from the experiential perspective of those directly involved.

Our understanding of hydration care for older people living in care homes in the UK is an emerging area of research. Current knowledge indicates that drinking insufficiently leads to dehydration and may lead to poor health, so to prevent this, residents should drink more because they are not drinking enough. This is a simplistic view of a complex problem which suggests that the solution to dehydration is to offer more drinks and the appropriate help, so putting the onus of responsibility on staff, but this assumption overlooks the need for insights into reasons *why* residents may not drink enough or *why* they do not appear to be offered enough drinks or appropriate and adequate help with drinking. Such understanding would need to see dehydration prevention as arising from interactions between multiple stakeholders including residents themselves.

Thus, the purpose of this study is to understand the facilitators and barriers in supporting residents to drink well from the perspectives of those involved, to inform the development of more relevant hydration care strategies by addressing the following research question (section 3.4.3):

> *Amongst residents, their families and care staff, what experiences, views and perceptions influence their approach to supporting residents to drink well to prevent dehydration?*

6.3 Methodological considerations

The substantive issue in this study was to understand the issues surrounding drinking from the perspectives of those involved - what kinds of issues are relevant to facilitate drinking in older care home residents and what kinds of issues present challenges. These are social issues and thus a qualitative interpretive approach is the most appropriate research methodology to address the research question because the researcher aims to understand the social world that people have constructed and the meanings that they have attached to it, acknowledging that people are constantly reinterpreting their social world depending on activities that they are involved in and the accumulation of new experiences[197]. As a researcher, my role was to gain access to these interpretations using social constructions and present them to an audience. In so doing, I became more of an 'insider', presenting an insider's view (emic perspective) being aware of the need of not imposing an 'outsider's' (etic) viewpoint[197,198].

The ontological and epistemological assumptions which guided this study were those of relativism and subjectivism respectively[199,200]. Ontology is the knowledge that, as researchers, we would like to access and in this case relativism acknowledges that there is no absolute truth, but truth is constructed within a social setting by the individuals and so is dependent on their views, perceptions, knowledge, understandings, interpretations, experiences and interactions which are meaningful properties of the social context. The epistemological perspective is a way of understanding and explaining what we know[201] and subjectivism assumes that we cannot separate ourselves from what we know. What I, as a researcher, know and understand is central to how I understand others, therefore there is a clear link between the researcher and the researched[202].

Guba and Lincoln highlight the complementary nature of the ontological and epistemological assumptions so that when an ontological position is selected, the epistemological position is evident, and vice versa[202]. However, Crotty[201] is less prescriptive, suggesting that researchers should be able to select the theoretical perspectives needed to guide the research design in answering the research question, as every piece of research is unique although there would always be some theoretical aspects which naturally combined, such as positivism necessarily entailing an objectivist epistemology. The essential point here is to understand the inter-relationship between the three theoretical aspects (ontology, epistemology and methodology) and when they have good internal consistency this provides rigour to the study[198].

6.3.1 Reflexivity

The epistemological nature of subjectivism means that the researcher is a dynamic participant in the research. Reflexivity is the way in which the relationship between the researcher and the researched is explored and explicitly stated and in doing so adds to the validity of the study[203], as Brannick and Coghlan emphasised:

> *"… a reflexive researcher does not simply report 'facts' or 'truths' but actively constructs interpretations of field experiences and then questions how these interpretations came about."*[203] *(page 145)*

Reflexivity is an ambiguous concept, meaning different things to different people, but it needs to be instrumental, otherwise it is self-indulgent. Mason suggested that reflexive researchers should review their actions and understand their roles within the research during the preparation, conduct, analyses and reporting of the findings[198].

In this study I was the lead researcher developing and conducting the research under supervision, as it formed part of my PhD. My previous and current experience of being a nurse, midwife, quantitative researcher and close family member of a resident requiring hydration care have contributed to the way in which I conducted, analysed, interpreted and reported on the findings from this study. To further understand my role within the research, I maintained a reflexive diary, journaling the logistics of the study, my rationale behind methodological decisions and my reflections on the process. Acknowledging and being open about my stance is a way of establishing trustworthiness and rigour in this study[204].

6.3.2 Research strategy

The research strategy is the logical way in which the research methods are decided upon to generate the data to answer the research question[197,198]. Of the four strategies described by Blaikie (inductive, deductive, retroductive and abductive) this study used an inductive strategy which starts with the collection of data, followed by data analysis, identification of patterns and possible theory development[197]. In contrast, deductive strategies work in reverse by starting with a theory and then testing it with data and is more closely associated with quantitative research designs, as illustrated in this thesis by the diagnostic accuracy study (Chapter 4) and systematic review (Chapter 5).

In this study I used purposive sampling, aiming to include participants with a range of experiences who would be able to talk about these with others in a focus group, which the researcher would record and explore the data generated using thematic analysis.

6.3.2.1 Rationale for purposive sampling

Sampling, the way in which participants are selected to take part in the study and the suitability of the sampling strategy is determined by the research question and research approach (here, interpretive), as well as practical considerations of costs and resources[198].

Purposive sampling required that care homes and participants were selected with characteristics linked to the purpose of the study to maximise diversity (rather than representativeness) to provide depth of information to inform our understanding of hydration care[205,206]. The separate focus groups for residents, family members, senior and frontline staff ensured that the dialogue within the groups reflected participants' particular perspectives and the views expressed related to the participants' own experiences and roles and allowed for comparisons between groups.

6.3.2.2 Rationale for focus groups

Focus groups are distinctive from other methods of exploring peoples' views in that the dialogue and interactions between participants contribute to the data set, thus the researcher can explore subjective experiences and meanings attached to those experiences by not only listening to *what* was said, but *how* it was said and the *context* in which it was said[207,208]. Whilst one-to-one qualitative interviews between the researcher and a participant may allow the researcher to explore a topic in more depth providing insights into each person's experience, they do not allow for the interactions and sharing of experiences which focus groups provide.

The group dynamic within focus groups may encourage participants to open up to each other, expressing feelings, attitudes and beliefs about the research topic, especially if it is based on shared experiences of everyday life[209,210]. These attitudes, feelings and beliefs may be partially independent of a group or its social setting, but are more likely to be revealed through the social gathering and may provide valuable insights into sub-cultural norms[207]. Therefore, I saw it as appropriate to use focus groups as the research method for this study and locate them in care homes where people lived, worked or visited, because care homes are institutions, each with its own unique culture[211], thus providing an opportunity to explore this aspect and how it may contribute to hydration care in each particular setting.

Another advantage of focus groups is that the group dynamic may reduce the influence of the interviewer on the participants as the balance of power can lean more towards the group[210]. Within the group, participation may be empowering for some members, particularly if the group works well and trust develops, although not everyone will experience this, especially inarticulate or shy members[207] or members of groups where there are perceived differences in social standing and this may be a disadvantage of focus groups. In this study there were dependent relationships between residents, and possibly family members as well, on staff and there was the authority which senior staff have over frontline staff, both of which may have had disempowering effects and/or inhibit frank discussions if the focus groups were made up of all types of participants, a point made by one of the family members following a discussion about trusting staff:

> **Sandy** *"That's why I'm quite glad we're here on our own, because sometimes the staff do sit in."*
>
> Family, Group-8

The discussion preceding this quote (about trusting staff) was unlikely to have taken place if the focus group had included residents and staff, as well as the family members, an issue I was mindful of when planning this study. Thus, I decided that separate focus groups for residents, family members, frontline and senior care staff would provide the range of views of hydration care I was interested in exploring. Whilst 'mixed' groups, which could have included residents, staff and family members in any combination would have resulted in very different interactions and provided alternative insights and perspectives, it is likely that some participants may have felt more inhibited to contribute in this kind of forum.

Communication is a key ability which participants require to participate in a focus group. People who have difficulties with communication, such as dysphasia, poor understanding, inadequate English language skills and/or hearing problems (and these issues are more prevalent amongst residents living in care homes) would require assistance to participate. Thus, to enable residents with sensory and cognitive difficulties to attend and take part in the focus groups, and so maximise participation[212–214], I carefully considered the type of assistance I could provide, guided by my supervisory team and the DRIE Advisory Groups. I was able to facilitate participation in the following ways:

- Providing information about the study in an accessible format (section 6.3.3).
- Asking participants if they required any particular types of assistance, which I may have been able to provide, as well as ensuring that they had brought any aids they usually used along to the focus group (e.g. hearing aids).
- Preparation of the room in advance: providing appropriate chairs, space for wheelchairs and walking aids, adjusting lighting, positioning of facilitator and co-facilitator (Co-F) to aid hearing.
- Use of clear language for the topic guide.
- Creating an unhurried atmosphere during the focus group, timing it so that it did not coincide with any other events or mealtimes; facilitator arrived early, met with participants and allowed time to arrive and settle in and during the focus groups, allowing people the confidence to take their time when contributing and ensuring that the group finished at the expected time.

Many of these points were applicable to all participants, not just residents, and by taking these steps I tried to ensure that all participants felt as comfortable as possible to facilitate participation. I was aware that the assistance I could provide was limited and thus I could not include people with more severe communication difficulties.

Whilst enabling people with communication difficulties to take part may have benefitted the research by providing another viewpoint, as the researcher, I also needed to ensure that all participants could engage in the focus group discussions as they wished, and that none of the participants were left feeling embarrassed or excluded by either their own or another participant’s difficulties, which may have been magnified in a focus group situation.

The important point is that all participants felt able to engage on their own terms, and that all members had an opportunity to contribute if they wished, ensuring that the discussions were not dominated unduly by others. It was my role, as the facilitator, to ensure that this happened[215].

6.3.2.2.1 Location of the focus groups

Deciding on the locations in which the focus groups took place was important, as this determined who was most likely to attend, it provided the context and influenced the individual’s well-being as well as the dynamics of the group and hence the data. No setting is entirely neutral, as each setting provides its own context and I had to consider the advantages and disadvantages of the choice of each location[206].

Participating in a focus group, which was a novel experience for most of the participants, can be daunting, and more so if conducted in an unknown venue with ‘strangers’, and so participants were more likely to feel confident and willing to participate if the group was located at a known venue with known people, where the only ‘unknowns’ were those associated with the focus group itself, and not the environment. Locating away from the care home is likely to have involved participants from different care homes which would have given very different perspectives, and it is likely that they would have included more able and confident residents and staff with more time and interest.

In this study the focus groups were located within a private room within participants’ own care homes (except the families’ group, where family members had relatives in two different homes, and the focus group was held in one of these homes). This had many advantages – it was a familiar environment, physically accessible for all participants and for residents, care was accessible and could be provided by staff known to them. For staff, less time was required as travel was minimised and some managers allowed their staff to participate during working hours. For the researcher there were advantages of higher recruitment rates, fewer costs and savings in time organising venues, travel and additional assistance. However, lower fieldwork costs for focus groups are often offset at the analysis stage as analysing focus-group data is more time-consuming[209].

The disadvantages of locating the focus groups in the care home may be that people may have wished to take part, but did not wish to be seen doing so, and that frank discussions could have been inhibited, despite privacy and assurances of confidentiality.

6.3.2.3 Rationale for thematic analysis

Thematic analysis was described by Braun and Clarke as a method for identifying, analysing, and reporting patterns (themes) within data[216]. This method of analysis was chosen because it is an inductive method which has strong links with the data allowing the researcher to identify themes to understand the views of the participants as well as the interactions and group dynamics between participants[217,218].

6.3.3 Ethical considerations

Integral to the research strategy are the moral and ethical dimensions to ensure that the research is conducted with integrity[198,200].

The current study was conducted in accordance with the University of East Anglia’s research policies and procedures, and with the approval of the National Research Ethics

Service (NRES), London - Camberwell St Giles Committee on 31/01/2014, reference: 14/LO/0127 (Appendix 16). Approval from NRES was required because this study aimed to include adults who lacked capacity to consent for themselves[219].

As well as general ethical considerations, there were particular issues relevant to this study which I needed to address. These were:

1. Gatekeeper consent (Appendix 17). Written consent was required from each care home manager where I recruited participants. This was to ensure that the manager, as the person responsible for the care and well-being of staff and residents, was fully informed about what the research was about and what it would involve for them (as managers or participants), their staff and their residents. Written consent also ensured that I had gained permission to conduct research work on their premises and that the appropriate public liability insurance was in place.

2. Approaching and recruiting potential participants to ensure that people understood the nature of the research and that they were willing to take part, with no coercion (this was particularly salient for residents). Managers in all the care homes included in this study approached potential participants in the first instance, distributing the Patient Information Sheets and making preliminary enquiries about who would be happy to be approached by me, the researcher. I visited potential participants twice, once to provide information and talk about the study and the second time to take consent.

   This staged approach allowed potential participants time to consider the study and discuss it with myself, friends, colleagues, staff and family members.

3. Ensuring informed consent. The process of obtaining voluntary and informed consent involves two complementary and reciprocal decisions:

   (i) "The participant should be able to make a decision about whether to take part or to refuse to be involved in a research project, having a general understanding of the research and its intentions and whether there are any associated risks or benefits.

   (ii) "The researcher judges the quality of that decision. If the quality of that decision meets certain ethical standards, the person is considered to have consented to participate or to have refused."[220] *(page 11)*

The Mental Capacity Act[221] requires that capacity should be assumed unless proven otherwise, but the researcher needs to be confident that a participant has capacity when taking consent. In terms of decision-making under the Mental Capacity Act, the key question for the researcher is:

"Does the person have the capacity to consent (or refuse) at the time the decision needs to be made?"[220] *(page 11)*

This applies to all potential participants, and so my role as the researcher was to ensure that everyone (residents, staff and family members) fully understood the research and their involvement within it, taking reasonable steps to do so[221].

Therefore, I developed two Patient Information Sheets (PIS) for this study (Appendices 18, 19). One contained detailed information, whilst the other summarised the key points, using simplified language, larger font-size and more pictures to aid understanding, particularly for people who may have difficulty reading and/or seeing, or understanding more complex ideas. Although I developed the summary PIS for residents who may have had some visual or cognitive impairments, I offered both information sheets to all potential participants, and the majority (staff, family members and residents) chose to read the summary version.

When taking consent I ensured that each participant had fully understood the nature of the research and their involvement in it, by asking relevant questions. For residents, where there was a greater likelihood that some may have had reduced levels of cognition and ability to understand what I was asking, so this process was formalised in line with the guidelines of the National Research Ethics Committee (NREC)[136] using an assessment of capacity approved by the NREC (Appendix 20). In this study, all resident participants were able to provide their own informed consent, but if that had not been the case, I had a system in place whereby I could ask for a resident's verbal consent to send a letter to their consultee via the care home, requesting assent. I used the same consent form for all participants, and as with the summary PIS, I included illustrations to aid understanding (Appendix 21).

The focus group was held a few days after the consent process, and verbal consent was obtained to confirm participation prior to commencement.

4. Maintaining confidentiality. Ensuring that participants remained anonymous and that personal data remained confidential is integral to research. Thus all identifiable information was removed from the data where possible and pseudonyms assigned to all participants. Where this was not possible, paper data were kept in locked filing cabinets in a locked office, and electronic data kept on secure UEA servers. However, it is not possible to guarantee confidentiality from the participants taking part in focus groups, so this risk was highlighted in the PIS, participants were asked to agree to maintain confidentiality on the consent form and the facilitator provided verbal reminders before and after each focus group.

   Audio recordings of the focus groups were deleted from the portable recording machines immediately following transfer to secure UEA servers where they were password-protected, and transfer to the transcriber was undertaken using secure methods.

5. Revelations. There was the possibility that a participant may have discussed issues which required further action, and therefore maintaining confidentiality would have been inappropriate. This possibility was highlighted in the PIS and the consent form, and again verbally by the facilitator just before the focus group began. In the first instance, the facilitator would have talked this through with the participant(s) concerned to decide on the course of any further action.
6. Sensitive issues. It is possible that focus group discussions could touch on sensitive issues with the potential to cause distress for the participants and/or the research team (facilitator, co-facilitators, transcriber, duplicate coders and supervisors). Therefore, procedures were put in place during the preparations for this study, to prepare for this possibility[222]. The preparations included:
   (i) A section in the PIS to highlight that sensitive issues may be discussed which some people could find upsetting. If this occurred, the PIS outlined how this would be dealt with and this was reiterated by the facilitator at the beginning and end of each focus group.
   (ii) I was guided by the care home manager as to which residents, family members and staff may be approached so as not to cause undue anxiety to those who may be particularly vulnerable, but at the same time recognising the right of individuals to take part in research if they wished to, even if it had the potential to cause distress[223].

(iii) When meeting potential participants to discuss the study (prior to obtaining informed consent), I also had the opportunity to identify people who may have found participating in the focus group distressing.

(iv) I met with each participant immediately prior to the focus group, to ensure that they wished to continue.

(v) I was accompanied by a co-facilitator for all the resident and family focus groups and two of the four staff groups. Part of their role was to assist with any participant who may have become distressed.

(vi) Following the focus groups I was available to provide further help, and I provided my contact details to all participants. I also contacted all participants a week later.

(vii) Within the research team we were able to provide mutual support, and debriefing sessions for each other if any distress was experienced.

6.3.4 Trustworthiness and Rigour

Trustworthiness, or rigour, refer to the quality of the research and how this can be assured throughout the study. Lincoln and Guba described four areas of trustworthiness to be addressed in qualitative research[204]:

(i) Credibility, or internal validity, refers to the believability of the research findings, whether the investigator presents a true interpretation of the participants' original data. Data generation and analysis should be appropriate to the research question and, as described earlier, the inter-relationship between the ontology, epistemology and methodology should have good internal consistency[198].

(ii) Transferability, or external validity refers to the way in which findings from one context can be applied to another. Purposive sampling is important to provide depth and range to determine the transferability. The presentation of the findings should provide sufficient information to enable the reader to determine the relevance and applicability of the findings to their own area of practice.

(iii) Dependability refers to the reliability of the research findings. To demonstrate this, the researcher should be reflexive and transparent about the research methods, providing a well-described and documented process.

(iv) Confirmability, or objectivity. Confirmability is achieved when dependability, credibility and transferability are achieved. The research is judged by the way in which the aims are achieved, so all methods should be clearly described to enable the reader to understand how the researcher arrived at their themes and interpretations, and where the researcher has made explicit her own biases and the influence these may have had on the study.

When designing this study I was mindful of these four criteria and ensured that I addressed them throughout the study.

6.4 Methods

In the previous section, the research strategy described which methods were used and the justification of methods selected. In this section I will describe the practicalities of how the study was undertaken: recruitment, conduct of the focus groups, analysis and outline for reporting findings.

6.4.1 Recruitment

Sampling was a two-stage process, where care homes were recruited in the first instance followed by the participants.

6.4.1.1 Recruitment of care homes

Care homes providing different categories of care (housing-with-care, residential care, nursing and/or dementia care) were purposively sampled and recruited with the assistance of ENRICH (Enabling Research in Care Homes, http://enrich.nihr.ac.uk/). Any care homes which had previously participated in the DRIE study were excluded due to their possible enhanced awareness of dehydration in older people.

6.4.1.2 Recruitment of participants

Purposive sampling ensured that I included participants with the following characteristics:

(i) Residents

- Aged ≥ 65 years.
- Male and female.
- Residents independent of staff for personal care and assistance with drinking.

- Residents able to help themselves to drinks.
- Residents dependant on staff for personal care.
- Residents dependant on staff to access drinks.
- Residents with cognitive impairments.
- Communication skills sufficient to participate in a focus-group discussion.

(ii) Senior staff

- Staff with managerial and/or supervisory responsibilities within the care home.

(iii) Frontline care staff

- Male and female.
- Health professional qualification.
- Care staff where English was a second language, but English skills were sufficient to participate in a focus-group discussion.

(iv) Family members

- Relative should be living in a care home, whom they visited at least twice a month (to ensure familiarity with the environment).

All participants completed a short background questionnaire indicating date of birth, sex, main first language, length of association with their particular care home (either as a resident, visitor or employee), job title (staff only), level of care required by residents (residents and family members).

6.4.2 Focus Groups

All focus groups were situated in a private room within the care home where participants lived or worked (residents and staff), and for the families' group, this was situated in one of the two care homes where the family members visited. Groups were held during the morning or afternoon, whichever was most convenient, and lasted approximately one hour. I provided hot and cold refreshments.

At the start of each focus group I introduced myself and the co-facilitator (if present), thanked everyone for attending, reiterated the purpose of the study and the ground rules and provided an opportunity for participants to raise any general queries regarding the conduct of the study. I commenced each focus group with the 30-second chorus from a 1933 song by Binnie Hale - 'A Nice Cup of Tea' (Appendix 22). I chose this song because it is well-known by many people, and the words were apt, so reinforcing the topic for the focus group, but also providing a common reference point[224].

6.4.2.1 Topic guide and facilitation

I facilitated all the focus groups and was accompanied by a co-facilitator for six of the eight groups. There was no co-facilitator for Group-5 and Group-7 because of the small size of the rooms made available. The four co-facilitators were colleagues at the UEA with experience of co-facilitation. Their role was to ensure that all points on the Topic Guide were covered, to prompt the facilitator if required, as well as making notes of points of interest that would not be recorded. This included seating plans, non-verbal communication, facial expressions, group dynamics and descriptions of unusual sounds. In addition, the co-facilitator assisted in welcoming participants, provided refreshments and being available should any participant need help or become distressed. Following the focus groups, the facilitator and co-facilitator reflected on the conduct and content of the focus group and identified any issues for inclusion in subsequent groups.

An iterative topic guide was prepared in advance (and approved by the NRES committee, Appendix 22) for each participant type. This was used to guide the discussions and ensure that key issues were covered, but at the same time allowed participants to move the dialogue into other areas more relevant to their own experiences, but still within the substantive area of the topic. Questions were worded carefully, using familiar language, and addressed tangible subjects rather than more abstract matters which are more straightforward for people, especially for those with any level of cognitive impairment, to discuss[214]. Beuscher and Grando also recommended using visual cues to aid discussion, so I took a variety of cups and glasses in which to serve refreshments, and use as a discussion point during the group (Figure 6-1), I had a bag of drinking aids (Figure 6-2) and four photographs of different types of drinking occasions which were available to bring out at an appropriate point (Appendix 22).

The focus group concluded when a natural conclusion was reached, or was gently brought to a close by the facilitator after 60 minutes (the agreed time allowed for the group). On switching off the recordings, participants were thanked once again, confidentiality was reiterated and I provided details of my availability following the group if anyone wished to discuss anything further. All members received a £10 voucher from a national chain of stores following the focus group, to thank them for their participation. Travelling expenses were offered but declined by all participants.

Figure 6-1: Selection of drinking vessels

Drinking Vessel 1

Drinking Vessel 2

Drinking Vessel 3

Drinking Vessel 4

Drinking Vessel 5

Figure 6-2: Selection of drinking aids

Drinking Aid 1

Drinking Aid 2

Drinking Aid 3

Drinking Aid 4

Drinking Aid 5

Drinking Aid 6

Drinking Aid 7

Drinking Aid 8

Nothing was disclosed during the focus groups which I considered alarming or requiring further action. No-one appeared distressed and no-one contacted me further, although I met or telephoned each participant within a week following the focus group, providing an opportunity for me to clarify any issues and to provide participants to ask any further questions.

The issues I needed to clarify generally revolved around the use of unfamiliar terms. Participants were generally concerned that they 'had done alright' or had done what was expected of them, but they also expanded a little more about some of their discussion points raised.

6.4.3 Thematic analysis

In this study, I used an interpretive inductive approach to thematic analysis described by Braun and Clarke, and followed their six phases[216]:

1. Familiarisation with the data.

    I listened to the tapes within 24 hours of each focus group to reflect on each session, to determine quality of the recording, identify any issues which may be distressing for the transcriber and coders, to identify voices of the participants and to identify key issues which were apparent at this early stage.

    On receipt of the transcripts, I listened to the recordings whilst reading the transcript, making any corrections as required. The most common corrections were amending the participants' names, as voices could be difficult to distinguish at times, and providing missing text where possible.

2. Generating initial codes.

    Transcripts were prepared for coding as follows:

    (i) Initial coding took place using paper copies, highlighting key words and phrases, adding in comments and thoughts about the interaction, intonation, non-verbal signs noted by the co-facilitators and any other relevant information, such as recent news items or background care home information.

(ii) The transcripts were imported into NVivo, version 11[225], and coded as per the paper codes, as well as identifying additional codes during the process. Codes in both stages were determined by DB inductively.

At this stage, any new areas not already included in the Topic Guide, were identified for inclusion in the next focus group, if appropriate. For example, one of the earlier staff groups discussed the issue of the media highlighting poor care and how this was found to be upsetting and unwarranted for the majority of care homes.

(iii) Coding was duplicated independently by two coders for some of the transcripts. One complete transcript was coded in duplicate, and three transcripts were partially coded. In total, 31% of the transcripts were coded in duplicate. DB and the duplicate coders discussed coding, and the few major differences were discussed, agreement obtained, and any changes incorporated into the final, 3rd coding run.

(iv) On completion of all the focus groups, and after each had been coded as described above, each focus group was coded a third time by DB to ensure standardisation of the coding methods used and if any new codes were identified, then these could be checked in the remaining groups.

On completion of coding and with constant reference to the data (transcripts, memos, records of supervisory discussions and reflective diary), codes were refined, duplicate codes merged and similar codes grouped using both NVivo[225] and Microsoft Excel 2013[145] to organise all data. All codes were linked to the appropriate focus groups and focus group type. 386 codes were identified and these were then reduced into 81 categories by examining the definitions and text associated with each code. This process ensured that I was thoroughly familiar with the data.

3. Searching for themes.

The next stage of the analysis involved reducing the categories into sub-themes and creating ‘mind-maps’ to look for emerging themes, with these steps being discussed by DB and FP (supervisor).

4. Reviewing themes.

   The themes were reviewed and refined following discussions with my supervisor and colleagues.

5. Defining and naming themes.

   Themes and sub-themes were identified and named.

6. Producing the report.

   In the following sections, the findings from this study are presented. Details of the participants (care homes and participants) are reported followed by a description of the themes and sub-themes. The findings are presented alongside the focus group data (quotes, observations and reflections), I make comparisons between focus groups and contextualise the findings within the context of wider research findings to provide further insights. The discussion draws the findings together to indicate how they have addressed the research question.

   This study is reported following the guidelines of the Consolidated Criteria for Reporting Qualitative Studies (COREQ)[131].

6.5 Findings

Characteristics of the care homes, participants and focus groups are described in section 6.5.1 and the findings reported in section 6.5.2

6.5.1 Characteristics of care homes, participants and focus groups

Twenty-nine participants were recruited from seven care homes in Norfolk and Suffolk, UK. Care homes provided either housing-with-care, residential care, residential with nursing care or residential with dementia care. There were eight focus groups (three resident, two senior staff, two frontline staff, one for family members, Table 6-1). All groups, except the families group, were held in the care home where participants lived or worked and all participants within a focus group were known to each other. For the families' group, participants were drawn from two different care homes and the focus group took place in one of these homes, so some participants were unknown to each other.

Table 6-1: Profile of participating homes

Type of participant	Type of care home	Number of beds	Number of participants	Participants known to each other?	Did focus group function well?	Focus group number
Resident	Residential	<30	3	Yes	Yes	Group-1
	Residential with nursing	30-50	2	Yes	No	Group-2
	Housing with care	30-50	5	Yes	Yes	Group-3
Senior staff	Registered for dementia care	>50	5	Yes	Yes	Group-4
	Registered for dementia care	<30	4	Yes	Yes	Group-5
Frontline staff	Residential	<30	3	Yes	Yes	Group-6
	Registered for dementia care	<30	3	Yes	Not initially	Group-7
Family member	(i). Registered for dementia care	30-50	4	Not all	Yes	Group-8
	(ii) Residential care with nursing	30-50				

6.5.1.1 General impressions of the focus groups

Before presenting my findings in detail I will describe some general characteristics of how the focus groups functioned. Many interactive features which are particular to focus groups, and which have been described by previous researchers, were displayed in the focus groups in this study. I would like to highlight four salient features here: the use of the vignette at the beginning of the focus groups, participants modifying their views during the focus group, the supportiveness between participants and using the focus groups to propose new ideas.

6.5.1.1.1 Use of the vignette to commence the focus groups

The way in which the vignette instigated the focus group discussions differed between groups. In Group-1, Freda (resident) sang along to the song and was the first to speak saying that she used to sing it with her grandmother and this prompted further reminiscences (section 6.5.3.1). The vignette also prompted an immediate connection in Group-6, where care staff were reminded that one of their residents used this song as a means of requesting a drink:

> **Cat** *"So when she's hinting for more tea, she starts singing it, you know?"*
>
> Carer, Group-6

In contrast, in the families' group, one participant seemed irritated by the song and so the conversation immediately following the vignette was stilted until the same participant stated that they were finding the conversation difficult and it was not relevant to what they wanted to talk about:

> **Sandy** *"I mean, I can't follow this thing, I'm just going to talk. "*
>
> Family, Group-8

After the participant said this they went on to describe their relatives' difficulties and care needs, and their concerns about not knowing whether their relative was drinking enough, and from that point the conversation flowed between all participants with the facilitator and co-facilitator occasionally cutting in if the discussion needed to be brought back on track (although the participants also did that for themselves) or to cover any remaining points in the Topic Guide.

In the other focus groups, discussions about tea were the starting point but the conversations moved in different directions subsequently.

6.5.1.1.2 Modifying views

The way in which participants change their point of view during a focus group has been observed[224] with some suggesting that this is a criticism of focus groups, as it is unclear as to who or what you can believe, but this is a simplistic view, as further exploration and analysis is required to identify what may have initiated the change of viewpoint[226]. In this study, there were three instances when it was particularly noticeable. In Group-4, Avril seemed to modify her views on two occasions, firstly when she was describing when she liked a cup of tea (section 6.5.3.4.1) and secondly when describing how drinking aids were used in her home (section 6.5.3.7.5). On both occasions she seemed to change her mind in order to conform to what others were saying, and during the whole focus group she would often look to the other participants for confirmation about views that she expressed.

In one of the residents' groups there was an obvious change in viewpoint by one resident, but the reason was less clear, and it may have simply been to poor memory. Nora seemed to have opposing views about whether having a catheter was a benefit or a barrier to drinking well, as these two quotes show (one was near the beginning of the focus group, and one near the end):

Nora *"I have a lot of tea usually, in the morning and at lunchtime. After dinner I sometimes have nothing"*

DB *"And that's because you don't want anything after dinner?"*

Nora *"No, I've got a catheter."*

Residents, Group-2

And near the end, when we were discussing restricting drinks:

Mavis *"I don't restrict myself."*

[…]

Nora *"Well I have a catheter, you see, so doesn't matter."*

Residents, Group-2

It was difficult to be sure about Nora's views, as she tended to contribute to any discussion using single sentences, and it was tricky to encourage her to expand.

6.5.1.1.3 Correcting and supporting each other

Participants in all the groups were not afraid of correcting each other, or helping to clarify what each other was trying to say, and this was usually undertaken in a supportive manner. In Group-1, Freda stated that she liked to drink her water straight from the tap, and provided a rich description of running home and going straight to the tap as a child. Later on in the group, she talked about still drinking straight from the tap, but this caused some confusion in the group as Freda was physically dependant and the other participants were confused as to her abilities to do this:

Zak *"Well, you and I Freda, we can't go to the tap because we're in, in our chairs!"*

Resident, Group-1

The residents in this group seemed to be particularly supportive of each other, helping each other out a number of times, and did not seem exasperated when someone repeated themselves, talked about something not directly relevant or even when one of the participants fell asleep!

6.5.1.1.4 Mooting and proposing ideas

Some participants used the groups to moot new ideas to gauge reactions from participants, especially if it might be controversial (sections 6.5.3.7.4 and 6.5.4.4.1). The focus groups also seemed to provide inspiration to develop ideas, as demonstrated by the carers in Group-6, when talking about reintroducing a drinks round that had been abandoned:

Bea *"I think that'd be a good thing, starting that again. Do you?"*

Aya *[talking over each other] "Well I'm going to write that down. […] Just writing a note for the communication book [laughter]."*

Carers, Group-6

6.5.1.1.5 General impressions of the three resident groups

The three resident groups were sited in a nursing home, a residential care home and housing-with-care. Participants included two men and 8 women and focus group sizes were between 2 and 5 people. All participants were aged ≥65 years. All could hear adequately to hold a conversation (with or without hearing aids), and whilst everyone provided their own consent it became apparent during the focus groups that three members (in different groups) may have had mild cognitive impairment, although I had no way of formally assessing this. This assumption was based on occasional repetition of the same anecdote, and/or muddling of details (e.g. a 78-year old participant talking about their 98 year old grandmother in the present tense). It was interesting to observe that in one focus group where a participant became muddled, the other participants were understanding and patient, whereas in another resident focus group, some participants were less understanding. Just one resident participant withdrew from the study prior to the focus group following consent, but no reason was given.

The resident focus groups included residents who needed assistance with personal care and fetching drinks, although all could remember to drink and could drink unassisted if the drink was placed in reach (Table 6-2).

Table 6-2: Profile of participants, by focus group type

Characteristic	Resident groups n=3	Senior staff groups n=2	Frontline staff groups n=2	Families' group n=1
Age range (years)	65-91	27-57	35-69	65-70
Female	8	9	6	3
Male	2	0	0	1
Length of time associated with care home, range (months)	2-96	6-120	48-192	12-54
Number of residents needing help:		N/A	N/A	
Help needed with personal care	7			4
Help needed with going to the toilet	2			4
Help with fetching drinks	7			4
Help with reaching a drink	0			4
Help with remembering to drink	0			3
Other relevant participant characteristics represented within the focus group		Health professionals Managerial roles	Night-staff English as 2nd language	

Of the three resident groups, the smallest one (Group-2), did not function well as a focus group, in that the two members did not seem to have a rapport with either each other, or the facilitator and co-facilitator. The group may have been just too small to function as a focus group. One participant responded to the facilitators' probing with one-word or one-sentence answers, which did not encourage a response from the other participant. This became a group interview, but even so there were a couple of occasions when the members interacted, both times it was due to a difference of opinion, with each member wanting to present their views. My relative inexperience as a facilitator (this was my second focus group) was also apparent as I seemed to find it difficult to encourage participants into conversing with each other, but it provided a good example of the way in which focus groups do not always function as planned, despite careful planning and preparation.

Discussions in the other two resident groups were lively and participants reminisced about drinking practices in their youth and childhood, as well as talking about drinking at this point in their lives.

6.5.1.1.6 General impressions of the four staff groups

Both senior staff groups took place in care homes providing specialist dementia care. The aim of purposive sampling with these groups was to include staff with managerial responsibilities within the care home. Of the nine senior staff, all had supervisory or managerial roles within the homes, all were female and some had health professional qualifications. Both groups functioned well as focus groups, with participants interacting, supporting each other and initiating conversations.

In the frontline staff groups, six frontline staff participated, all were female, one participant spoke English as a second language and one participant was permanent night-staff. I was unable to recruit any male staff. In care homes, those with health professional qualifications tend to hold more senior roles, and so participants with these qualifications participated in the senior staff groups. Frontline staff groups were sited in homes providing residential care only and residential with specialist dementia care. One of these groups (Group-7) did not function well as a focus group initially, in that there was limited interaction between participants, so one participant tended to contribute more and seemed to be compensating for her two colleagues. Also, as the facilitator, I resorted to asking more questions, rather than allowing silences to encourage the participants to speak. The dynamic of this three-person group was such that the participant who spoke English as a second language spoke very little but appeared to understand well. One participant appeared nervous initially and so answered questions defensively and abruptly. Both these participants had distinct experiences and roles within the homes, and as facilitator, I tried to encourage them to talk about these. This was reasonably effective, with the participants becoming more conversational towards the end of the group and there was more interaction between participants. The other frontline staff group (Group-6) was a complete contrast, with participants chatting freely, supporting each other and helping each other out to finish sentences and to move the conversation along.

The senior staff groups tended to discuss policies, procedures and systems much more fully than the frontline staff groups, and occasionally it felt that I was hearing what they wanted me to hear. In contrast, the frontline staff groups provided more descriptions of actual practice.

I found that the familiarity of participants with each other in the staff groups resulted in the use of ‘group codes’ where the participants knew each other so well, they did not complete sentences, but seemed to understand what each other was saying, but this was not always apparent to the facilitator. In these situations, participants also talked over each other, making transcription very difficult. This was illustrated by Group-6 where I had started a conversation by asking about training:

Cat *“Was that on the telly you were on about?” [talking over each other, inaudible]*

Bea *“That was about elderly people getting… that was… you know…”*

DB *“And you find that useful to… ?”*

Bea *“Yeah, I’d… you know, ‘cos I think that’s important” [talking over each other, inaudible]…*

Aya *“… television adverts…”*

Bea *“Do you think that’s important?”*

Aya *“… they do need a bit… we do…” [inaudible]*

Bea *“… but like I said, I’ve always thought it’s easier said than done, you know?”*

Carers, Group-6

Although at one point I seemed to have some sort of understanding, as the conversation moved on I was unable to track it, and could not grasp the full meaning of what was being said. I had asked about training, but this was not what they seemed to be talking about and as I had lost the thread, I moved the conversation along into a new topic area. When I met with the participants the following week, they were unable to remember what this conversation was about.

6.5.1.1.7 General impressions of the families’ group

There was one focus group for family members, with the four participants representative of two homes, therefore not all the participants were known to each other prior to the focus group. All family members reported visiting their relative at least once a month and that they were regular visitors during the time that their relative had been living in residential care (between 1 and 4 years). Family members were either a spouse, sibling or adult child of a resident. Their relatives were living in either a specialist dementia home or a nursing home and had either cognitive, physical, or a combination of both, difficulties regarding drinking (Table 6-2).

The participants in this group actively engaged with each other, discussed their mutual concerns, identifying with each other's situations and giving voice to issues they had previously only thought about. The families group discussed a number of issues around drinking and the change in their caring role now that their relative was living in a care home. Participants appeared supportive of each other, sharing their experiences to illustrate commonalities as well as differences in their experiences. In this group there was a health professional and whilst I knew this, this participant did not share this information with the other participants, although the authoritative tone which they used to talk about some issues meant that the other participants deferred to them at times.

6.5.2 Findings: theme descriptions

Three themes and 20 sub-themes were identified describing 'the meaning and experiences of drinking' for all participants, 'caring roles' and the third theme: 'tensions and barriers to successful drinking', which was inherent within both the first two themes (Figure 6-3, Table 6-3).

6.5.2.1 Theme 1: 'The meaning and experiences of drinking'

This was an over-arching theme where participants talked about drinking, reasons to drink, what they liked to drink and particular occasions and places they liked to take drinks and the kinds of drinks which they enjoyed or disliked. Residents reminisced about drinking at earlier stages in their life, and used a variety of anecdotes of water or drink-related events to illustrate their discussions, whereas staff and family members tended to recount anecdotes relating to their care of residents.

6.5.2.2 Theme 2: 'Caring roles'

Caring roles to support drinking are situated within participants' views of the meaning and experiences of drinking. All participants expressed views about their caring roles in meeting the hydration needs of residents, but the extent of how these were shared and acknowledged by other participant groups was variable.

6.5.2.3 Theme 3: 'Tensions and barriers in supporting residents to drink well'

Participants expressed a number of tensions and barriers about the meaning and experiences of drinking and tensions within the caring role which had a negative impact on hydration care.

The findings from this study will be discussed in the next section, using the sub-themes from Themes 1 and 2 as the main headings. The sub-themes from Theme 3 ('tensions and barriers to successful drinking') will be discussed throughout the findings where they are relevant.

Figure 6-3: Visual representation of themes

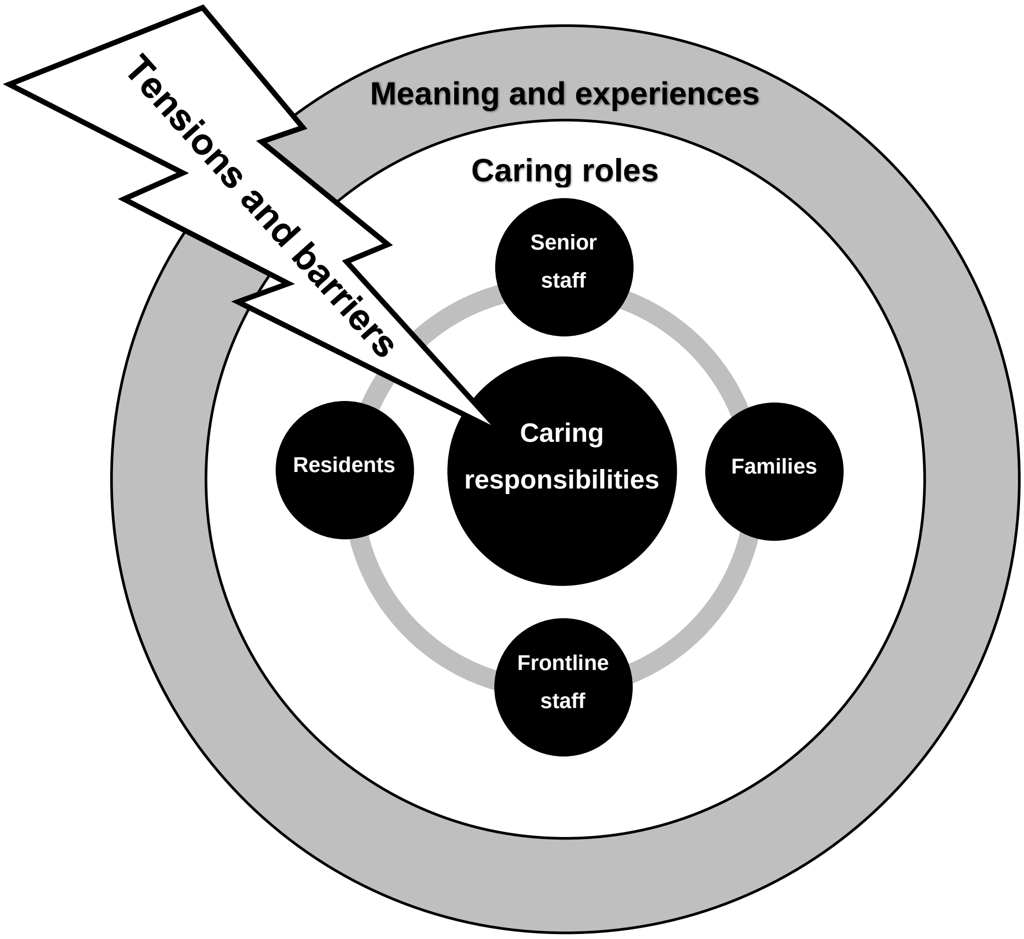


Table 6-3: Themes, sub-themes and categories

Themes and theme descriptions	**Sub-themes *(section number where discussed)***	**Categories**
1. Meaning and experiences of drinking *(section 6.5.3)* *An overarching theme where participants talked about drinking, describing their views about the meanings and experiences of drinking. Descriptions include negative and positive experiences.*	Reminiscing and hospitality (section 6.5.3.1)	• Residents describe drinking norms prior to living in care home, including as a child, at work, as a parent • Providing drinks, particularly tea, was a form of hospitality for friends and visiting workmen • Providing or preferring water was not seen as giving or receiving hospitality • Hospitality is not seen in the same way today • Manner of providing hospitality has changed with changing abilities
	Anecdotes (section 6.5.3.2)	• Anecdotes about water-related events
	Changing drinking habits (section 6.5.3.3)	• Manner of drinking has changed between generations
	Views about drinks preferences (section 6.5.3.4)	• Views expressed about specific drinks (when to drink, when to avoid, use of particular brands, manner of serving): ○ Tea ○ Coffee ○ Water ○ Cold drinks ○ Alcohol • Sweetening drinks • Personal preferences changing over time • Priorities change with time/need • Resident views of staff drinking habits
	Residents realising drinks preferences (section 6.5.3.5)	• Residents manage their drinking needs depending on abilities and help available • Acknowledging limitations and need for help • Expectation that staff will provide appropriate help • Residents choose whether to accept help and advice offered • Expectation that staff will respect autonomy in decision making • Residents supportive of staff and appreciative of help provided

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Themes and theme descriptions	Sub-themes ***(section number where discussed)***	Categories
	Drinking serving a purpose, having a reason to drink (section 6.5.3.6)	• Friendship/hospitality • As a treat • To stay healthy ○ Prevent dehydration ○ Residents describe responding to advice to drink more ○ Residents aware that staff are responsible for them drinking well ○ Personal experience of dehydration • To quench thirst • Drinks themselves seen as a medicine • Water to aid swallowing of medications • To drink enough is seen as ‘work’ • Drinking out of boredom • Family or other cultural influences
	Availability of drinks (section 6.5.3.7)	• Availability (manner, timing, choice, routines, flexibility of routines, providing drink-making facilities and/or opportunities to access own drinks) • Use of drinking aids: matching aid to need • Availability of aids • Use of thickeners • Visual prompts
	Drinking practices relating to micturition (section 6.5.3.8)	
	Effects of the social and physical environment on drinking (section 6.5.3.9)	• Activities (within and external to the home incorporating drinking) • ‘Mapping’ of residents • Staff eating and drinking with residents • Place of ingestion (choice of rooms provided) • Minimising sensory overload (setting of tables, noise, ‘busyness’)

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Themes and theme descriptions	**Sub-themes *(section number where discussed)***	**Categories**
	Costs (section 6.5.3.10)	
2. Caring roles ***(section 6.5.4)*** *Describes how staff, residents and family members view their caring roles in ensuring residents drink well, how these caring roles are shared and the issues which support or hinder the conduct of these roles.*	Residents' care needs for drinking (section 6.5.4.1)	• Intrinsic resident issues around cognition ○ Remembering to drink ○ Poor realisation of thirst sensation ○ Poor understanding of need to drink ○ Recognising that a drink is there to be drunk ○ Fluctuations in behaviour, preferences, abilities ○ Poor communication ○ Unsocial behaviour ○ Dementia as a debilitating condition • Intrinsic resident issues around physical abilities: ○ Arthritis ○ Sleepiness ○ Swallowing problems ○ Fetching and reaching drinks ○ Physical dependence for toileting assistance
	Resident's role in managing their own drinking (section 6.5.4.2)	• Residents see that they have a role in managing their own drinking in partnership with staff
	Family member's roles as carers (section 6.5.4.3)	• Families recognise that relative's care needs are beyond what they, as the family, can provide • Families acknowledging that relative is dependent on staff for all care needs • Families appreciate care given to resident • Families foster positive relationships with staff • Families feel supported by staff • Staff helping families ○ Staff see the distress of families ○ Staff see families as needing support and that they, as staff, provide support

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Themes and theme descriptions	**Sub-themes *(section number where discussed)***	**Categories**
		○ Staff inclusion of families in relatives’ care ○ Staff encouraging family involvement in care
	Care home and care staff roles and responsibilities to support residents’ drinking (section 6.5.4.4)	• Staffing structure ○ Staffing levels ○ Formal management structure ○ Senior staff take responsibility and provide guidance and support for frontline staff ○ Informal support systems for staff • CH policies, procedures, practices aiming to reduce dehydration risk ○ Dehydration seen as preventable and poor practice ○ Providing drinks is seen as part of care provision ○ Help and assistance with drinking is part of care ○ Staff training to increase awareness of dehydration and importance of drinking ○ Monitoring intake and output ○ Documentation seen as protecting staff ○ Communication between staff ○ Use of hidden fluids ○ Staff incentives to eat with residents ○ Personalised care: assessing need and meeting that need ○ Acknowledging residents’ preferences ○ Acknowledging autonomous decision making of residents ○ Involving residents in decisions around choice of new tea-service ○ Kitchen support • Health professional support
	Staff meeting needs (section 6.5.4.5)	• Carer’s personal skills to aid drinking ○ ‘Knowing’ residents (‘picture building’, understanding individual residents communication; ‘sub-liminal awareness’) ○ Working out preferences ○ Pre-empting needs ○ Empathy

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Themes and theme descriptions	**Sub-themes *(section number where discussed)***	**Categories**
		○ Drawing on personal experiences ○ Perseverance ○ Developing own methods to help residents drink
	Fostering sense of well-being amongst staff, residents and families (section 6.5.4.6)	• Personal sense of pride and achievement when help is effective or appreciated • Staff feeling that they are appreciated by residents • Fondness for residents • Care home seen as ‘home’ • Pride in own care home/ lack of criticism regarding own home • Own care home seen as ‘better’ than others • Staff feeling that they are appreciated by families
	Care staff frustrations with external criticisms about poor care (section 6.5.4.7)	• Hospitals seen as providing insufficient drinks and poor care, in contrast to the good care provided by care home staff
3. Tensions, dilemmas and barriers around drinking and caring *(discussed in sections 6.5.3 and 6.5.4 when relevant)* *This theme describes how there are tensions*	Tensions and barriers around drinking	• Specific drinks or drinking at certain times associated with poor health or other deleterious effects • Anxieties about micturition and consequent reluctance to drink • Drinks provision inappropriate, insufficient or disliked ○ Carer effect on making drinks ○ Drinking vessels not easy to hold • Drinking aids ○ Dilemmas regarding use: independence vs dignity ○ Opposing views regarding use of aids ○ Stigma • Previous poor experience of drinking • Dislike of some environments in which to take a drink • Perceived pressure to conform and change drinks preferences to ‘fit in’ • Reluctant to ask for help, complain or ask for extra drinks • Acknowledging limitations, but reluctant to ask for help

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Themes and theme descriptions	**Sub-themes *(section number where discussed)***	**Categories**
and dilemmas for all the participants about the meaning and experience of drinking and within the caring role of ensuring that residents drink enough.	Tensions and dilemmas in providing help with drinking	• Staff see residents as lacking confidence • Residents unaware of importance of drinking • Residents choose not to drink • Help offered is disliked • Help offered is ineffective • Deception • Previous poor experience with assistance • Providing care can be challenging and difficult at times • Sense of frustration • CH systems inhibit practice ○ staff time required to feed residents ○ shift patterns ○ communication difficulties between staff and between staff and families ○ opposing priorities • External criticism, staff feel unappreciated ○ Hospitals ○ Media ○ Families
	Tensions and dilemmas in the shared caring roles	• Tensions between staff and families, as perceived by staff ○ Staff find that families are reluctant to be involved in care ○ Staff perceive that families have unreal expectations of care provision ○ Staff say they sometimes provide an aspect of care because families request it, rather than because they think the resident needs it ○ Staff perceive that families lack understanding of the nature of dementia and its effects on their relative and their diminishing abilities • Tensions felt by families about their relative and their role as carer ○ Families describe distress at relative's level of dependency ○ Families caring role has changed now relative resides in care home ○ Families relieved that they have relinquished caring responsibilities, but in doing so control has been forfeited

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Themes and theme descriptions	**Sub-themes *(section number where discussed)***	**Categories**
		○ Families become ‘voice’ of the resident ○ Anxieties about coping abilities and development of coping strategies ○ Effects on own health • Tensions felt by families about their relative’s care ○ Families feel their continuing caring role is unacknowledged by staff ○ Families feel excluded from care ○ Lack of information and communication regarding resident’s drinking ○ Families having to trust that relative will receive appropriate care ○ Concerns about care of resident, based on ‘evidence’ (resident appears thirsty, drinks half full/finished, drinks out of reach ○ Resident receiving care from Agency staff who do not know them ○ Families acknowledge limits of care which staff are able to provide, but wanting resident to receive personal care ○ Anxieties about voicing concerns and in doing so, possibly compromising resident’s care ○ Families acknowledge strained relationships between themselves and staff

6.5.3 Theme 1, ‘Meaning and experiences of drinking’

This is an overarching theme where participants talked about drinking, describing their views about the meanings and experiences of drinking. Descriptions included negative and positive experiences.

With the exception of residents in Group-2, all participants talked with ease about drinking itself, what drinks they liked, when they liked to drink them and why they liked to drink. The two residents in Group-2 did not converse easily with each other, and although they would answer questions, which Mavis would expand on far more than Nora, neither resident seemed fully at ease during the group. Residents from Group-2 and Group-3 reminisced and shared anecdotes about childhood memories and life prior to moving into the care home, whereas family members tended to share stories about their experiences of looking after their relatives. In the staff groups, anecdotes were generally more directly related to the residents they were responsible for, describing instances of when someone drank particularly well as a result of their action, or what caused someone to not drink so well. Staff in one group described their experiences of dehydration and used these anecdotes to empathise with residents in their care. Just as participants talked about positive experiences associated with drinking, there were also discussions around what hampered their drinking experiences. All these aspects of drinking will be described in more detail in the following sections.

6.5.3.1 Reminiscing and hospitality

Residents in Groups 1 and 3 talked fondly and at length about childhood memories of drinking when they were young. A recurring topic was the way in which drinks were provided as a way of showing hospitality, demonstrating good manners and friendship to friends and family and appreciation of people coming to the home, such as workmen providing a service. It was within this social context, of hospitality and developing relationships, that I offered drinks to all participants at the start of each focus group.

In Group-1, this conversation was prompted by the vignette used to open the focus group (section 6.5.1.1.1) where Freda, after singing along, immediately went on to describe how she used to sing this song with her grandmother, as a child:

Freda *“I used to sing that as a child with my grandmother […] whenever anyone came to the front door, ‘Would you like a cup of tea?’”*

Resident, Group-1

Betty agreed with her and went on to describe her own memories of offering hot drinks to workmen, but because they commented about not getting many offers ‘now’, Betty thought that this kind of hospitality had changed over her lifetime:

Betty *“They used to say, ‘Oh, thank you ever so much, Mrs Jones. […] We don’t very often get offered a cup of tea now.’ […] No, I don’t think they offer now. […] there isn’t that sort of friendship, […] I say ‘friendship,’ […] you rely on these people, don’t you? The boiler man, […], the electrician and especially the heating engineers […], that’s the first thing I always used to offer somebody if they came in and were doing a job for me.”*

Resident, Group-1

Betty used the term ‘friendship’ when talking about workmen, although she went on to correct herself to distinguish between friendship and reciprocity. In another resident group, Terry described a similar type of hospitality in his childhood home, adding that visitors were always given a fresh cup, and not one from the pot which had been standing around:

Terry *“[…] when I was living at home, […] the teapot never got cold. […] Anyone come round, the first thing – kettle went on even if it was quite warm in the pot, they had to have a fresh one.”*

Resident, Group-3

Hospitality is not just about offering drinks, it is also about accepting the offered drink. Freda, who disliked tea and coffee, described what it felt like to refuse offers of these drinks and therefore the hospitality being offered:

Freda *“You felt like you were refusing their hospitality and they felt like they wanted to give you something, but they didn’t know what on earth they could give you!”*

Resident, Group-1

As a water drinker, Freda felt that she was seen as being rude by refusing people’s offers of drinks, and therefore their hospitality. This may relate to a cultural attitude where providing water could be seen as not providing the expected hospitality. Reflecting on this, I noticed that I had the same attitude if visiting friends had refused all offers of either hot or cold drinks and ‘only’ asked for a glass of water, I also felt that they were refusing my hospitality. Similar views have been described by Ashworth and Gusfield. Ashworth, a researcher, reflected on her own interactions with research participants, and commented on the surprise people expressed if she asked for water, leaving her feeling that she was being impolite by refusing offers of tea and coffee. She went on to describe how she started to accept offers of tea and coffee to indicate the reciprocity of the relationship she was involved in when interviewing people in their own homes and that this had a beneficial effect when building relationships between herself (as the researcher) and participants, and therefore the research as a whole[227]. The way in which Ashworth explained this illustrates the way in which Caplan described how drinking together mitigates against possible power divides[228], and Gusfield has suggested that drinks and drinking are markers of group identity with specific inclusion and exclusion criteria for people being part of a group or not, so being offered and accepting drinks enables a person to be part of a group, and thus refusing, or being refused drinks is excluding[229].

The way in which residents in this study had described hospitality in the past prompted me to ask about whether they were able to provide drinks as a form of hospitality to friends and family visiting them now, and if so how they managed this. The participants of Group-3 lived in housing-with-care, so they had their own flat with a kitchenette and facilities to make hot and cold drinks, leaving them independent and in control of how and when to serve drinks. These participants talked about providing drinks for visitors, but the way that they did this had altered as a result of changes in their abilities, so those residents who were able to, made drinks, but for those residents less able, the visitors made the drinks, as these participants described:

Coral *"Yeah, I'll make a cup of tea or coffee, or they do it themselves when they come in, the family, yeah."*

Co-F *"[…] Is that something you do, Louie? Do you tend to make a drink if someone visits?"*

Louie *"Oh, yes, that's the first thing they do, put the kettle on."*

Co-F *"Yeah. So that sounds like a common thing?"*

Terry *"Sociable thing." […]*

Opal *"Because they come in for a game of Scrabble, and now I put the cups out and they usually make the tea, then they usually do the washing up, as well!"*

Residents, Group-3

Offering drinks as hospitality was described in a slightly different way by the residents in Group-2, and residents in Group-1 did not discuss this at all. Neither group mentioned whether their visitors were provided with drinks by the care staff. Participants in Group-2 seemed unsure about whether they, as residents, were permitted by the care staff to make their own drinks in the tea-making facility provided by the care home. Whether this facility was solely for visitors to make drinks, or for visitors *and* residents, seemed to be uncertain, and was a point of disagreement between Mavis and Nora.

DB *“[…] is there anywhere where you can go and make yourself hot drinks, at all?”*

Mavis *“No, no, there isn’t.”*

Nora *“Yes there is!”*

Mavis *“Is there?”*

Nora *“Yes!”*

Mavis *“Oh!”*

Nora *“Yes. Rosemary goes, Rosemary who visits me, she goes and makes herself a drink”*

Mavis *“Oh, is that for the visitors or is that for us as well?”*

Nora *“Well, I don’t know ‘cos I’ve never been there.”*

Mavis *“No. I think there’s some… um, you know, things to make it for visitors.”*

Nora *“I know they don’t have to pay anything for it.”*

Mavis *“No, no they don’t.”*

Residents, Group-2

For Nora and Mavis, their uncertainty about whether they were permitted to use the tea-making facilities for themselves seemed to indicate the way in which they viewed their position in the care home as one of dependence where they required permission from staff to use the tea-making facility.

Participants in the families’ group also talked about the availability of tea-making facilities for visitors, although they did not mention anything about being offered drinks by care staff when they visited. On the other hand, the staff in all the groups *did* talk about offering relatives a drink to take with residents, associating it with the positive impact of social facilitation and social modelling on those who were reluctant to drink, rather than relating it to courtesy or hospitality. The discrepancy between the descriptions of residents and family members with those of the staff about being offered drinks may well result from them all being associated with different care homes, and therefore reflecting different practices.

Reminiscing about offering and receiving drinks as hospitality illustrated the way in which drinking is a socio-cultural experience, and the way in which the offering and receiving of drinks expresses relationships between people[230]. However, this aspect of drinking was not discussed at all in the staff or family focus groups.

6.5.3.2 Anecdotes

Talking about drinking stimulated some interesting anecdotes from the residents in Groups 1 and 3. These related to water, but not necessarily to drink, with an anecdote about a helicopter rescue for a drowning man, being attacked by swans at a day out by the river and how roads were made. Drink-related anecdotes included obtaining drinking water when on holiday abroad, childhood memories and recent experiences in restaurants and hospitals. There were mixed reactions from fellow participants to these anecdotes, some listened patiently whilst others did not. In one group a participant could be heard ‘huffing’ and banging their cup during a re-telling and the co-facilitator for that group noted that none of the other participants appeared to be listening either, although they were being more subtle about it as they had their eyes closed and were ‘nodding off’.

Residents’ anecdotes seemed to be more wide-ranging than those of their carers, which were more focussed around the study purpose. Staff tended to relate anecdotes more directly related to residents in their care and in the families’ group, participants were supportive of each other as they related anecdotes and shared experiences about life with a relative living in a care home.

Kitzinger observed how focus group participants used anecdotes as of demonstrating another dimension of understanding[224], and this seemed to have been demonstrated in this way in this study.

6.5.3.3 Changing drinking habits

An intriguing observation mentioned in Groups 1 and 3, was the way in which some participants discussed their own observations of how they thought the way in which people took drinks in had changed over their lifetime. Participants in Group-3 discussed this at some length, agreeing with each other in describing how, when they were children, they had drinks at set times during the day, and as they often felt thirsty, they drank a whole cup, whereas the impression they had of younger people today was that as they always had a bottle of water with them, they were constantly sipping, and so never really felt thirsty:

Terry *“You were always taught, as a child, to drink when you were thirsty, you didn’t just cart it about wi’ you.”*

Coral *“No, no.”*

Terry *“…and you drank like a cup full of water or a glass of water, whereas they just take a mouthful, now.”*

Coral *“Yes, that’s true, yes, they do.”*

Terry *“Now they don’t take no significant amount, so they don’t really quench their thirst, anyway, do it? They can’t be thirsty just…”*

Pearl *“…dry, it’s to wet your mouth, isn’t it?”*

Terry *“Yeah, but they take more to combat dehydration but if they’re only taking a small amount of water every time, they might as well have one glass of water rather than carry a bottle about. […] That’s the biggest change, I think.” [some agreeing ‘yeah’s’]*

Residents, Group-3

Cat, a frontline carer, also remarked on how drinking habits seemed to have changed from when she was a child compared to her own children, although in a slightly different way. Cat explained that as a child she was not encouraged to drink, but she drank what she was given, whereas she thought that her children (now ‘grown-up’) and their friends had a different attitude where they drank water because they chose to and they enjoyed it, and not because they had to so this seemed to be a ‘better’ habit which was likely to be life-long:

Cat *“I know my children have always drank water, not because I’ve programmed ‘em for water. […] but when they got older […] they made their own decision, they had water and all their friends do. […] They will keep drinking water for all the right reasons. […] I think when they get to a certain age, if they enjoy drinking water or they enjoy drinking, they will carry on, you know? I think that’s a different age thing. […] “See, as a child I wasn’t encouraged to drink […] you drank what you were given.”*

Carer, Group-6

Cat implied that the residents she was looking after would have had a similar upbringing to herself where drinking was more functional and less enjoyable.

As well as commenting on other people, residents acknowledged that in some cases their own preferences had changed over time, perhaps due to a change in their likes and dislikes, or as a result of advice, as Opal described:

> **Opal** *"In the paper it says that it was, you know, good for people to drink coffee.*
>
> *[…] "I only have one cup of coffee a day, that's because they said it was good for you, but otherwise it's always tea."*
>
> Resident, Group-3

In another resident group, Freda described how she felt pressured to change her preferences and conform by drinking tea or coffee, drinks which she had never liked, as she always preferred water (and still did):

> **Freda** *"I never drank anything other than water until about, it must be about some four, four/five years ago […] I thought oh, I don't know, I'm going to have to take that cup of tea even if I don't drink it all!" [chuckling].*
>
> Resident, Group-1

When Freda was describing this, it was unclear whether this change occurred as a result of moving into the care home, or whether this had happened before that, but it did seem that it had occurred later on in life[4].

The insights gained from understanding and acknowledging life-long habits and the way they can and do change will inform ways of supporting residents to drink well.

6.5.3.4 Views about drinks preferences

All participants talked about what they drank and when they drank it. For residents, cold water and tea were cited most frequently as the drinks they preferred. Staff opinions of residents' preferences seemed to mirror residents' own views, with staff also stating that they found that most residents preferred tea, water and other cold drinks. However, staff

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[4] *Freda reported that she had lived in this care home for two years, but she seemed to imply at another point that she had lived in another care home previously, but as she also got slightly confused about times in her life, it was difficult to know for sure.*

were also keen to point out that they were aware that individual residents had their own preferences and that, as staff, they were aware of these:

Cat *"That's just basically knowing their needs and what they like and what they don't really."*

Carer, Group-6

For residents, tea was the preferred first drink of the day, water at mealtimes and as a 'back-up' ('there is always water'), as Mavis pointed out:

Mavis *"There's always, you know, water and that available so you can have it whenever you like, sort of thing."*

Resident, Group-2

This view was shared by the staff who felt that providing jugs of water or squash and ensuring that these were freely available, was part of their care, and in doing so they had done their job effectively.

Ada *"Those that are able will have a jug of juice in their room and a beaker, so that they can help themselves as they need to, or water, whatever cold drink they prefer to have in their jug."*

Carer, Group-7

However, other residents had strong views about jugs being left lying around, as illustrated by Freda:

Freda *"The life seems to go out of it."*

Resident, Group-1

It was not only care homes where this happened, but hospitals, too, as Pearl and Opal pointed out:

Pearl *"When you go into hospital, you get given a jug and that stands there about six months [laughter] and it's warm…"*

Opal *"Yes, horrible."*

Pearl *"…. and then they wonder why you don't drink it!"*

Residents, Group-3

Residents often referred to liking water ‘cold', expressing mixed views about whether to drink tap water or bottled water, although they talked about liking water from water coolers where these were available. However, whereas residents stated several times about liking water ‘cold’ (meaning ‘fridge-cold’), there was no mention by staff that they had any awareness of this preference.

Resident’s comments about how they preferred to take their water recognises that water has aesthetic qualities in the same way that other drinks do, and it is not the flavourless, odourless, ‘neutral’ drink which it is often described as[231].

6.5.3.4.1 Discussions about tea

Discussions about tea, the drink, provided insights into some interesting views. It was the only drink which was discussed as being associated with any particular meal; it was often preceded by a possessive adjective (‘my’, ‘her’) and it was the only drink that triggered a discussion about preferred brands. Brands of other drinks were mentioned as descriptors, but they did not become the focus of the discussion in quite the same way.

In Group-4 following the introductory vignette (‘A nice cup of tea’), staff not only talked about whether they liked tea (and not everyone did), but for those who did like tea, staff talked about when they drank it and the type of meals that a cup of tea was best drunk with:

> **Avril** *“I wouldn’t have a cup of tea with a meal, I’d have it to start me off in the morning and then I’d have coffee at elevenses. And in the evening I might have a cup of coffee, but I just have the three a day.”*
>
> **DB** *“Does anyone like a cup of tea with a meal?”*
>
> **Una** *“No, I find it too filling.”*
>
> **Alex** *“It depends what the meal is, because fish and chips and a cup of tea seems to go quite well.”*
>
> **Avril** *“Yes, that’s the only time I’d have a cup, cup of tea… fish and chips or if I had a piece of toast or a crumpet or something.”*
>
> **Una** *“And maybe breakfast you’d have a cup of tea, so that is a meal, I suppose, but other than that, I wouldn’t have a cup of tea with anything after breakfast.”*
>
> Senior staff, Group-4

The flow of the conversation is interesting in this extract, in that Avril introduced the idea of tea with a meal, but then said she would not drink tea with a meal. However, after Alex said that she liked tea with fish and chips, Avril changed her mind. Una also seemed to change her point of view. I am not sure why this was, unless they were both keen to contribute to the start of the focus group and so said something without thinking, modifying it when they did have time to think. Although Avril seemed to modify her views a number of times during the discussions (section 6.5.1.1.4).

Tea was sometimes preceded by a possessive adjective (e.g. "my tea"), more so than for any other drink, but whenever a possessive adjective was used, it was to emphasise a particular liking for that drink, as Nora and Gail both described:

Nora *"Yeah, I like my cup of tea."*

Resident, Group-2

And:

Gail *"She does like to have her tea."*

Resident, Group-8

Whilst residents described liking tea, there were no discussions about how they actually liked to take their tea (although they had about water). Betty, a resident, mentioned that she always had tea in a pot at home, and when I asked about having a pot of tea at the care home, she said that she could, but a cup of tea was enough for her now:

Betty *"You can if you want it, but quite honestly, a cup of tea is enough for me."*

Resident, Group-1

As Betty provided rich descriptions of her drinking rituals at home, I probed her once or twice during the focus group about whether she was able to have drinks served in the care home in the way that she had described having them at home, and rather than say that she was not getting quite what she wanted, she preferred to say that she had changed her preferences, as she did in the quote above and again when she talked about changing her preference to coffee when they served 'awful' tea (section 6.5.3.5).

In Group-3 specific brands of tea became a discussion point:

Louie *“I like Brooke Bond tea bags, […] because we’ve always had Brooke Bond.”*

Opal *“I’ve always had the little blue bags, tea for one, can’t remember what make that is?”*

Terry *“Tetley in’t it? That’s what I normally have.”*

DB *“Does it make a difference, the brand? Can you taste the difference?”*

Coral *“Yes, yes!”*

Terry *“Yes, and actually, they make them different, like Yorkshire tea is made for different parts of the country.”*

Opal *“Yorkshire tea is one of the best you can have. It’s expensive isn’t it?”*

Coral *“I have Ringtons that is from up in the Midlands, somewhere. […] They deliver with a van, so then he brings all sorts of tea and biscuits and lots of Christmas things, really good.”*

Residents, Group-3

Residents seemed to have their preferred brands for different reasons, either because they had always had them, it was a brand that was suitable for one person or it was from a company which did special deliveries.

In Group-4, when I asked the staff about why they thought residents liked tea, they thought it was because tea was a much cheaper drink for residents when they were growing up, so it was the more familiar drink, whereas coffee used to be more expensive and so was considered a ‘special’ drink.

Coffee and other drinks did not trigger the same kinds of discussions as tea and water, with participants stating quite simply whether or not they liked them. Although caffeinated drinks (particularly coffee) were avoided by some residents and family members (but not all), as participants in Group-8 described:

Gwen *“I think sometimes if you have caffeine late at night that’s something that can keep you awake.”*

Frankie *“It definitely keeps me awake.”*

Doris *[…] “I don’t find anything like that at all. I drink anything at any time, really.”*

Family, Group-8

After water, tea-drinking is the most commonly consumed beverage world-wide, with 80% of adults drinking it in the UK[232], so it is not surprising that tea and water were the drinks most commonly discussed during the focus groups, especially as tea-drinking has been associated with the UK way of life, described by Hazan as:

> *"…. an established cultural pattern deeply entrenched in the daily life of English people*."[233] (page 206)

In this ethnographic study of a day-centre for older people, Hazan observed that tea-drinking also acted as a temporal code, which moved the day along, in a similar way that Pat described when talking about encouraging residents to have a drink:

Pat *"'Oh, the tea trolley will be here in a minute.' That, in a way is encouraging them to think about having a cup of tea, 'The tea trolley will be here, oh, it's half an hour and we'll all be sitting down for a cup of tea.'"*

Senior staff, Group-5

Pat used the imminent arrival of the tea-trolley to provide temporality to the day, to encourage the resident to drink and as an act of friendship, reaching out to the resident, in much the same way that the residents described in section 6.5.3.1.

Some of the findings reported in this study about tea mirror those of Hannam, who interviewed five older women living in the community about the meaning of tea-drinking. She described six themes associated with the meaning of tea-drinking[234]:

- People drink tea for many reasons, including hospitality, comfort or to rest.
- Descriptions of the social context in which tea is drunk provide meaning (e.g. family gatherings).
- Tea-drinking provides temporality to the day.
- Descriptions of past and present tea-drinking practices provide insight into changing lifestyles.
- Drinking tea is a multi-sensory experience.
- Descriptions of objects used to prepare and serve tea provide insight and meaning about preferences (such as cup or mug).

6.5.3.4.2 Staff describing residents' preference for sweetness

Staff in the three staff groups located in homes providing dementia care talked about how they had observed residents preferring sweet things, as illustrated by Avril and Tia:

Avril *"They tend to develop a sweet tooth, I find."*

Tia *"They'll eat, you know, sort of pick probably at the first course but the sweetness comes with the desserts. They're just gone, you know, like custards and things like that, they, they do love those."*

Senior staff, Group-4

The same observation was made by staff in other groups, using this preference for sweetness as one of their strategies if residents were not drinking well, as Pat described:

Pat *"You make them what they usually have and they don't drink it. So we try something different. We put milk in or we put sugar in it or we take sugar away – or, you know, we do whatever until we find something that they like […] they may change again tomorrow […] so we try juice or hot chocolate or coffee until we find something that today they like."*

Senior staff, Group-5

There is some evidence that the recognition threshold for sweetness increases with age, where higher levels of sugar are needed to provide the same taste sensation[235] but there is also some concern that an increased sugar intake may be a contributory factor to an observed increase in tooth decay in residents following admission to care homes[236].

6.5.3.5 Residents managing or realising drinks preferences

As residents had talked about what drinks they liked and times of day when they preferred or avoided certain drinks prior to moving into a care home, I was interested to know how they managed to ensure that their preferences were met now that they were living in a care home and dependant on staff to provide drinks; whether residents felt able to ask for drinks between the routine provision and whether they felt able to ask for drinks to be served in a certain way and if they did, how the staff responded. Residents and family members (but not staff) both stated that residents only had to ask, but residents (and families' reports of their relative's actions) did not describe doing this in practice. Instead, residents seemed to prefer to adapt and modify their preferences and fit in with the care home's routines by waiting for the usual rounds of drinks, accepting the drinks offered and relying on staff to notice what help was required, as described by these residents:

Freda *“They are very good with… if you’ve got any difficulties in things, but you’d have to say that you want it.”*

Betty *“Sometimes I do have a job to lift the cup up, but I’m sure if I did say they would do something, but I manage and, and that’s me […] I like to be independent.”*

Zak *“Yeah. They do so much for us.”*

Betty *“Oh, don’t they just!”*

Zak *“I always try to, er,…”*

Betty *“… help…”*

Zak *“… not, er, and to help and not ask for too many bits and things…”*

[…]

Freda *“I’ve found that after you’ve been here a little while, they watched and then you haven’t even had to say, ‘[…] they’ll spot it and then it’s there and that is very good.”*

Residents, Group-1

In this extract, residents acknowledged that they had physical limitations and that they needed assistance, but they also wanted to maintain their independence so they preferred to wait until the staff noticed their difficulties, rather than asking for help. By *not* asking for help or assistance, these residents saw themselves as helping the staff, by not adding to their workload.

Residents seemed to adopt a similar approach of being reluctant to comment or complain about drinks being served in a way they disliked. In section 6.5.3.3, Freda described how she conformed and started to drink tea and coffee, and in the following quote, Betty described how she preferred to change her preference, rather than complain about the awful tea (although she thought other people may have complained):

Betty *“When I first came here, […] they made awful tea. […] I turned to coffee. […] but now it’s quite good.”*

Co-F *“Wonder what’s changed?”*

Freda *“Person making it I reckon!” [chuckling]*

Betty *“I think probably quite a few people complained. […] it was dreadful. It was cold, very cold, but now you get a lovely hot cup of tea.”*

Residents, Group-1

There were few negative comments made about staff by residents in any of the focus groups, although Betty came close to it here. Residents were appreciative of the care staff and uncritical of the care they were providing, in a way that suggested that they were willing to make personal changes rather than seem ungrateful or complaining. Therefore, observant staff who noticed difficulties and interceded were not only appreciated by residents, but it is a key role for carers in ensuring that residents who are reluctant to ask for help, receive the assistance they need to drink sufficiently.

Families' shared similar experiences to the residents when they talked about how their relatives' were not able to or did not like to ask for drinks, as Frankie described about her father:

> **Frankie** *"He's a very stoical man and he does what he's told, so if he got thirsty he would wait till the staff came, he wouldn't even try to tell them he was. You know, they're a generation who did put up with things. […] He forgets to ask and he wouldn't ask."*
>
> Family, Group-8

Similarly, families talked about how their relatives' would not say if they were given a drink they disliked, and families were frustrated when their relative was served a drink which they had never liked, as Frankie described when this happened to her father:

> **Frankie** *"He doesn't want that sort of thing [i.e. juice]. In fact, if he's given orange juice, he won't drink that, and he will sometimes say, 'I want water,' or sometimes he just won't drink it."*
>
> Family, Group-8

In the same group, Sandy described how his wife (Dee) was given tea (which she liked) but it was not made how she liked it:

> **Sandy** *"Dee would have hardly any milk, just perhaps a teaspoonful in a cup of tea, so it was nearly black, and I've told them so many times and they bring it up with milk in and they say, 'I've brought Dee a cup of tea,' and I say, 'She won't drink that.' And I know she won't."*
>
> Family, Group-8

In both cases, residents had dementia and were unable to verbally communicate their preferences, so Frankie and Sandy were their relatives' advocates and were irritated because they thought that their relatives were not getting what they wanted or preferred because the staff bringing their drinks were unaware of their preferences.

In contrast, staff liked to think that they were meeting residents preferences, that part of their admission procedures were to find out about these, but preferences could change as staff from Group-5 explained:

Sally	*“Well, in the first instance we would ask at the assessment […] what is their preference? That can change, as their dementia… things can change, you know?”*

Senior staff, Group-5

Changing preferences, which could occur on a daily basis, was challenging for the staff, as described by Pat when describing how residents may influence each other’s choices; her frustration is very apparent:

Pat	*“They’ll all want coffee or they’ll all want tea and you think, [lowers voice] ‘She doesn’t like tea, I’ll make tea!’ and they drink tea and that was a lovely coffee – and that’s fine!”*

Senior staff, Group-5

For residents who were unable to verbalise their preferences, staff described how they ascertained residents’ preferences and changes in preferences by trial and error or observing what the residents drank or did not drink:

Sally	*“They’ll leave it.”*
Ruth	*“They’ll leave it.”*
Sally	*“Wouldn’t touch it.”*
Pat	*“That’s how we know……”*
Pat	*“We* ***can*** *make notes about it, we’ve got their likes and dislikes, which we can change, but mostly it’s just by… we’ll verbalise it.*

Senior staff, Group-5

Ruth echoed Sally’s words, Sally reiterated what she had just said and Pat confirmed it, suggesting that they were all in agreement with what was being said. This supportive interaction was evident in all the staff groups for much of the discussions, although in Group-7 the rapport developed during the session, rather than being apparent from the beginning.

To account for any differences between recorded preferences and the drinks currently being served, staff said that they were guided by the residents themselves. In the staff group following the families’ focus group where family members had discussed their frustration about their relative being served drinks they had always disliked, I was interested in whether staff had ever been questioned by families about why their relative was seen to be receiving different drinks:

DB *“How do you find that families take that on board, if they find that their relative is having, you know, a drink that they didn’t used to have?”*

Sally *“Most of them are pretty good. […] Sometimes they’ll query it, and they will sort of say, ‘Oh, that’s unusual.’ Think that’s what they’ve asked for, you know, we have to, we have to give them what they ask for. But they wouldn’t… they don’t normally argue about it. […]”*

DB *“Do you find… are you bothered by that or are you very happy to share that information?”*

Sally *“Oh, no, we’ve got to share it with them, y’know?”*

Pat *“It is, as I say, the biggest thing is, you make them what they usually have and they don’t drink it. So, we try something different.”*

Senior staff, Group-5

This extract seemed to suggest that the staff were not pro-active in discussing any changes with families, although they were happy to address the issue if it arose. This certainly seemed to tie in with what the families were saying too, that they were finding their relatives’ were being served different drinks, but not knowing why this should be, so making the assumption that mistakes were being made in their care, and leaving families apprehensive about whether their relatives’ care needs were being met. Relatives seemed to be apprehensive about raising these kinds of issues with staff (section 6.5.4.3), so for both families and staff there appeared to be tensions around communicating information about everyday caring issues concerned with drinking.

Another aspect of care which Freda pointed out in a previous quote, was the difference between carers in how they provided care, and this was certainly noted by family members, as Doris and Sandy described:

Doris *"I do find that it differs from carer to carer."*

Sandy *"Absolutely!"*

Doris *"You know, some say: 'Oh, I usually help Kay if you're not there,' because if I'm there obviously I help her drink it, and some of them do say 'I usually help, but would you be alright to help Kay?' And others I've seen just leave the drink."*

Sandy *"Yup, I've seen that. I'm here every day and I do see that."*

Family, Group-8

The differences between carers and the care they provided was another source of concern for families about whether their relative was having enough to drink.

I asked staff about whether residents asked for drinks. In the three groups based in dementia homes, the response was that their residents could not express themselves in this way, but residents would use other ways of communicating when they wanted a drink (as previously described). However, in the staff group based in a residential home where many of the residents would have been able to ask for drinks, staff said that not many residents asked for drinks directly:

Cat *"Yeah, we don't, we don't get many that say 'can I have …'"*

Carer, Group-6

Residents living in 'housing-with-care' managed their preferences very differently. They were expected to be independent of staff for drinks provision, although staff were available should there be any difficulties. As such, these residents could make their own drinks when they wanted them, as well as making any adaptions as to what, when and how they took their drinks, making alterations to suit themselves and their changing needs. They talked about using melamine tableware because it was lighter, selecting a cup which suited their needs and using smaller kettles or the microwave to heat drinks. Similarly, they had adapted their own personal routines around drinking to accommodate their changing abilities, and these were described in the present tense, as Opal described:

Opal *"I tend to save a little, half a cup of something, and then I just… I can't cope with a kettle, you see, so the last one at night, I drink half and then I put the other half back in the microwave. […] if I wake up, go to the toilet and I want a drink, I don't call the staff or anything, I just heat up my tea again in the microwave."*

Resident, Group-3

We also found at this focus group, that when we were offering and making drinks, these residents made very specific requests about how their drinks were made, such as requesting sweeteners (rather than sugar), decaffeinated coffee (rather than caffeinated) and water from the tap (rather than the water cooler which was in the same room). Residents in the other groups made less specific requests, they were asked what they would like to drink, but they did not make such specific demands. It is impossible to say whether the differences we noted were due to the residents in Group-3 being particularly forthright, or as a consequence of their greater independence and remaining in control of their drinking.

The greater independence of the residents living in housing-with-care was manifested in the way that they talked about a wider range of choices for each aspect of their drinks and their assumption of being able to make these choices and that they would be met. Whereas for residents in the other two groups, the range of choice was diminished, and residents in Group-1 particularly, seemed to feel less able to verbalise their preferences, and would rather change preferences and adapt rather than ask for help or state what they wanted. This behaviour seemed to echo Balte and Balte's theory of selection, optimization, and compensation for successful ageing where people develop alternative strategies to avoid negative outcomes and to compensate for losses[237].

6.5.3.6 Drinking serving a purpose, having a reason to drink

Pat Caplin, a food anthropologist, described food as:

> *"Food is never just food and its significance can never be just nutritional*."[228] *(page 3)*

Drink could be similarly described, and all the participants discussed reasons for drinking and what its purpose might be. In section 6.5.3.1, providing drinks was seen as providing hospitality and friendship and as a way of thanking people who provided a service in their homes, but drinking serves other functions too.

6.5.3.6.1 Treats

Drinks and drinking were described on several occasions as being a ‘treat’, either the individual drink itself, an activity where drinks were the focus (e.g. making smoothies or ‘afternoon tea and reminiscence’) or as a key component of a wider activity such as visiting a coffee shop during a trip to a garden centre. Treats are defined by the Oxford English Dictionary as:

> *“An event or item that is out of the ordinary and gives great pleasure.”*[2].

The idea of enjoying a ‘treat’ drink on its own was raised by Alex when talking about enjoying a liqueur after work:

> **Alex** *“It’s one of my favourites. Yeah, I don’t drink it all the time, though!”*
>
> Senior staff, Group-4

Alex was keen to make sure that we all knew this was an occasional rather than a regular habit, so reiterating the concept that it was a treat.

In his work on drinking rituals, Gusfield described how alcohol marks the transition from work to leisure time[229], and the way in which Alex described how and when she drank a liqueur would fit in with this concept. But when drinks are offered as treats, they are also a gift and a way of offering friendship, in much the same way as offering hospitality[238].

Drinks as treats were identified in the initial focus group, so it was then included in the topic guide at subsequent groups, and many participants identified certain drinks or drinking occasions as treats.

Social occasions where drinking is an integral part of the event uses both the occasion and the drink to provide a treat experience, such as when the participants of Group-3 discussed the sherry and mince-pies they were expecting after that evening’s carol service to celebrate Christmas:

> **Pearl** *“We gets a glass of sherry tonight! […] With the mince pies, with the carols.”*
>
> Resident, Group-3

The use of alcohol in social gatherings helps to set the mood and distinguish it as something special and different to everyday events[229].

Whereas many of the treats described related to alcohol, there were some that did not, and Pat, working in a home for people with dementia, described making an everyday event (having a coffee) into a treat for one lady who was reluctant to drink:

> **Pat** *"We've got one lady who sometimes won't have a cup of coffee, 'Well, I'd love a cup of coffee, do you want to come and have a cup of coffee with me?' Grab a little drink, sit down, it takes two minutes, you can drink your coffee, it's gone, she's drinking her coffee too. [whispers] 'Shall we steal some biscuits off the trolley?' and, you know, make it a little bit of a treat. You can do that ten times a day!"*
>
> Senior staff, Group-5

Not only did Pat turn the ordinary into a treat, by changing the focus of the activity, she used her knowledge of the positive impact of drinking together to help her resident to drink, and in such a way that it was time-effective and not annoying to the resident, as repeated prompting to drink was often described as being upsetting (section 6.5.4.5).

6.5.3.6.2 Alcohol

Alcohol is associated with being a treat, because it is used as a 'keying device' to mark leisure time[229]. Staff discussed alcohol in terms of a treat, such as 'Pimms in the Garden' or 'Beer on a Saturday night' but discussions around alcohol also revealed some other aspects of care. In the following extract, Alex described how she acted on a resident's comment about liking gin and tonic with her lunch, to show that she was proactive in providing person-centred care (a term used several times in this group particularly):

> **Alex** *"There was a lady recently who said, 'I do love gin and tonic at lunch,' and actually, just making a mental note of that, making sure that's on a record […] then we'll try and make sure."*
>
> Senior staff, Group-4

In the same group, Avril talked about Pimms on a summer afternoon, in this case demonstrating that as a home they were providing interesting and exciting activities:

> **Avril** *"We always have Pimms, don't we, on a summer afternoon? I'm quite proud of that. Don't think many care homes do that!"*
>
> Senior staff, Group-4

Both these quotes illustrate how these staff seemed proud of their proactive and progressive approach to providing care in their home, which included their approach to alcohol. However, it could be interpreted as a way of reinforcing the power/dependency relationship between staff and residents, as staff who allow alcohol are in a position of authority.

Small quantities of alcohol taken occasionally is often seen as acceptable, but in excess it has detrimental effects, so offering and promoting alcohol use in people with complex health problems could be seen as being irresponsible. Avril was aware of this, and pointed out that they would not offer alcohol if there were contra-indications:

> **Avril** *"Some like a glass of wine […] if there are contra-indications […] we'd buy low-alcohol wine that doesn't look like low alcohol […] because they'll soon pick up on that, won't they?"*
>
> Senior staff, Group-4

Rather than refuse alcohol for someone with contra-indications, Avril described how they substituted it with low-alcohol wine, hoping that the residents would not notice. By posing the question at the end ('won't they') she seemed to be including the other participants in this deception, and several participants responded with 'yes'. This group was not the only staff group to talk about alcohol in this way, as Bea in Group-6 described:

> **Bea** *"He was always drinking the cranberry. […] One of his daughters said to me, 'Excuse me Bea […] do they have red wine with their dinner?' and I said, 'No,* ***that's*** *why he's asking for a top up! Well…' I said, 'Well, let him think it!' Because if anyone brought him a drink before we got to it, half would be gone, yeah!"*
>
> Carer, Group-6

Using deception in this way was discussed almost as if it was acceptable to admit to using deception as we were talking about 'alcohol' which in itself could be seen as 'naughty'. The use of deception was touched on a few times by carers as a method of helping residents to drink more if drinking was a particular problem and so is discussed further in section 6.5.4.5.5.

6.5.3.6.3 Water with, and as, a medication

Residents and staff both viewed water as the only drink with which to take medications, with the added benefit that taking medications encouraged the drinking of extra water, as Una described:

Una *"That's [i.e. water] another form of liquid, so that helps a little bit, I suppose."*

Senior staff, Group-4

There was also the view expressed in the families and resident groups, that drinks should be seen as medicines themselves when there is concern about poor fluid intake. This is illustrated by Frankie and Sandy's discussion:

Frankie *"It's maybe trying to get the staff to regard the giving of fluids as medicinal, because they give medicines regularly when they're told to."*

Sandy *"Yes, yes, well Dee [wife] has them regularly."*

Frankie *"And they tick it off."*

Sandy *"Yes they do!"*

Frankie *"When my mum was dying and they felt she ought to have a little fluid every hour, there was a chart outside her room with the times on and how much she drank, 5ml, 10ml, by sips."*

Sandy *"That's a good idea."*

Family, Group-8

Frankie sometimes spoke authoritatively and made a number of suggestions about care and what she thought should be done, many of which were met positively by the other participants.

6.5.3.6.4 Drinking to be healthy

All the participants expressed knowledge about needing to drink to be healthy, as Freda stated very explicitly:

Freda *"I would be dead very quickly if there was no water!" [laughter].*

Resident, Group-1

Family members talked about dehydration being unhealthy, but also Frankie related it to feeling uncomfortable:

Frankie *“If you’re dehydrated you’re uncomfortable.”*

Sandy *“Yes, well it’s very unhealthy to be dehydrated isn’t it?”*

Family, Group-8

Feeling uncomfortable due to dehydration was described explicitly by carers in Group-6 when they related their personal experiences about how they had each experienced dehydration, how unwell they felt as a result of it and how they felt ‘silly’ for allowing it to happen, as they both recognised that they were being active in a hot place and had not been drinking enough. They then related these experiences to the residents in their care, not wanting them to feel as they did:

Bea *“I got dehydrated and I think I was nearly in tears, I just couldn’t quench my thirst, I can’t describe what a horrible feeling that was.”*

Cat *“And how ill that can make you feel. […]”*

Aya *“I get one of my migraines if I don’t as well.”*

Cat *[…] “And that’s hard, because if you’ve gone through experiences, I know they’re not out in the sun like we are or walking so much, but they still need to know that they need to drink large…” [talking over each other]*

Bea *“Yeah, I think if they’re feeling like I felt that day, you know?”*

Carers, Group-6

This empathetic approach to providing care was described on several occasions by staff, where carers related their own experiences and views to how they thought residents may feel.

Both staff and residents were aware that in hot weather or in the hot environment of the home, then both groups needed extra fluids. Staff talked about providing residents with extra drinks as well as ‘hidden fluids’ in the form of jellies, lollies and yogurts for the residents, as Una described:

Una *“We get ice creams in as well, ice lollies, […] in the summer, get someone to go round with cold drinks as well as the tea trolley.”*

Senior staff, Group-4

Staff, when they mentioned it, seemed to be aware of looking after themselves too, as Tia described:

Tia *“But even for us […] we wouldn’t work properly, would we, to assist our residents if we didn’t drink as well?”*

Senior staff, Group-4

Although not all staff followed their own advice, as Bea admitted, although she seemed to be unusual, as Cat commented after:

Bea *“But do you know, I’m naughty here. […] but while I’m working I’m not drinking.”*

[…]

Cat *“Some of the staff always bring a bottle in, of juice or water, and they’re at it all their shift.”*

Carers, Group-6

Residents, where they remarked on staff drinking habits, said that they seemed to drink well:

Pearl *“Oh, the carers make sure they drink. […] You see, they’re racing about, aren’t they….and it’s warm.”*

Resident, Group-3

Drinking well for health reasons also meant responding to advice if it was seen as coming from an appropriate source. For residents, they described being advised by care staff, their GP, family members and newspaper articles. Advice related to drinking more, as well as to the types of drinks which should be drunk, such as drinking more water but avoiding caffeinated drinks to lessen the risk of incontinence, prevent urinary tract infections and waking at night.

Opal *“My daughter says you should just drink water, water, water, water!” [laughing]*

Resident, Group-3

On the other hand, Pearl got quite irritated about being given advice to drink more by staff who were saying one thing but had been observed doing the opposite:

Pearl *“The staff went to a meeting about hydration and they came back with these bundles of leaflets, and one of them said to me, ‘Oh, can I give you this to remind you to drink?’ I said, ‘No, you don’t need to give anything.’ I said, ‘Give it to the staff to remind them to give it to people who can’t get it their selves.’”*

Resident, Group-3

Pearl was referring to a recent incident when she had noticed how a lady in a neighbouring dementia unit had not been offered any drinks over several hot summer afternoons. This was also one of the few negative comments any resident made about care staff, and it related to someone else’s care, rather than her own.

There seemed to be little advice about how residents could increase fluid intake, although two residents in different groups each described how they had devised their own method, of putting what they needed to drink in a day in the fridge, so they knew whether they had drunk sufficient. Another resident described how she counted up the number of drinks she had each day to make sure she was drinking enough. These descriptions illustrate how residents themselves took the view that they were actively involved in managing their own drinking, and not just reliant on staff, something which a colleague observed when developing a Drink’s Diary for residents to record and monitor their own drinks intake[239].

6.5.3.6.5 Drinking as ‘work’

Two participants expressed views that drinking enough to stay healthy should be seen as ‘work’.

Gail *“You’d be surprised […] that [i.e. drinking] does sort of fill our day in lots of ways!”*

Carer, Group-7

Whilst this was certainly part of carers’ roles, it was interesting to hear a resident describe it in a similar way:

Betty *“I’ve tried to work during the day […], in the morning I drink more water than I do all through the day.”*

Resident, Group-1

Betty was describing her response to her doctor’s advice to drink more, describing it as something that she had to work at to ensure that she did drink enough.

When water is seen as medicine, or something to be worked at, then drinking has moved from a social activity to a physiological necessity with life-sustaining undertones and marks the change in priority from being part of a social experience.

6.5.3.6.6 Boredom

One staff participant (Cat, Group-6) thought that residents sometimes drank out of boredom so that the drinks routines provided temporary relief from this, as well as providing temporality to the day.

6.5.3.7 Availability of drinks

Availability of drinks refers to any step in the process from obtaining a drink to it being swallowed by a person, so it involves making or being provided with a drink, placing it within reach, being able to lift it to the mouth, taking it in and swallowing it. Thus, poor availability occurs when difficulties are associated with any of these steps, so affecting the ability to drink and the experience of drinking.

6.5.3.7.1 Drinks service

Drinks service discusses how care homes, as institutions, provide drinks. There were four main ways in which this was described:

- As a routine.
- As the need arose, as identified by carers.
- On request by the residents.
- Facilities for residents to serve themselves drinks.

The manner in which drinks were provided was discussed by all participants, as it was an aspect of care everyone was familiar with. There was a general consensus amongst most participants that sufficient drinks were being served, and this could be attributed to the routines within the home and the proactive way in which staff provided extra drinks when required.

Just one family member remarked that she did not think there were enough drinks being offered, and this was because her mother liked a cup of tea after lunch, but as only cold drinks were served lunchtimes, she had to wait for the tea round, which took place middle of the afternoon.

Drinks routines were an important component of the way in which care homes delivered drinks, as Olive pointed out:

> **Olive** *"I think we're very conscious that they're completely dependent on us on making sure that these drink rounds happen."*
>
> Senior staff, Group-5

Working in a home specialising in providing care for residents with dementia, Olive was aware of these residents' greater dependence on staff.

For residents, too, routines were an important part of the home life, and they talked about their '7 o'clock' drink or their 'elevenses', but only in Groups 1 and 2, where residents were provided with drinks. Residents living in housing-with-care were more independent and had created their own routines, but routines nevertheless, indicating that much of our drinking is habitual. Terry described his routine very specifically:

> **Terry** *"The first thing I do is put the kettle on and then normally have a wash and get myself….., and then I have another cup of tea and then I have one mid-morning and I have one about four o'clock and then no more until I have one just before I go to bed."*
>
> Resident, Group-3

Family members described their relatives' routines prior to moving into the care home, remarking that they were asked about these routines on admission, but they were replaced by the care home's routines. This was stated matter-of-factly by Frankie, who recognised the difficulties of catering for all residents' individual preferences:

> **Frankie** *"Mine [i.e. Frankie's parents] definitely were people who stuck by their rituals [description of rituals]. When they went into Merton we were asked about their habits and at what times they normally had things, but, of course, when you're looking after 40 people, you can't let everybody have their drinks, so their routine was disrupted when they went in and what effect that had, I don't know."*
>
> Family, Group-3

Staff also stated that they asked about routines and drinks preferences on admission, and although they tried to meet drinks preferences, no-one commented on why they should ask about home routines if the care home routines were going to be imposed anyway.

Routines are an important component of care, especially in institutions where routines ensure that things happen and are not left to chance. Serving drinks regularly is particularly important for residents who would forget to drink otherwise, as Doris explained:

Doris *"I think if my sister was offered a drink at any time of the day she would say yes. […] Although she would never say, she can't articulate very well, and she would never be able to tell anyone 'I'm thirsty, can I have a drink?'"*

Family, Group-8

In tandem with established routines is the need for a flexible approach within the established systems requiring staff to adapt to resident's personal circumstances or other external changes and so provide drinks and hidden fluids in between the usual rounds, when required, such as during the hotter summer months, as staff in Group-5 described:

Sally *"I think in the summer it's more a constant drink round […] going round with the jug of juice, y'know, topping up…."*

Pat *"… like jellies, ice cream, …."*

Senior staff, Group-5

Both staff and families were aware that drinks service may be compromised if staff were busy elsewhere, although this seemed to relate to additional requests for drinks, rather than impinging on the routine provision, as Frankie described:

Frankie *"But because they're always busy, if you ring the bell just for a cup of tea and they're off changing somebody or hoisting somebody, you don't get your tea when you want it and you may not actually feel like it when it comes, because it may have gone into water time or gin and tonic time."*

Family, Group-3

Only one member of staff mentioned that routine drinks service was sometimes compromised because of other priorities:

Ada *"If we have time in the morning, it all depends – that sounds horrible, but if we've had a smooth shift and things are going well in the morning and we're not getting buzzers going off, as we're getting them up we do like to offer them a drink, but that very often isn't the case, but we do try and do that."*

Carer, Group-3

Providing drinks as a routine, not only provides temporality to the day, which helps to move the day along[233,234] and orientates residents, especially those with dementia[240], but routines ensure that the drinks service happens and that it is not left to chance. This is reassuring for all those involved, especially if the culture of the home is such that drinks provision is prioritised over other events, because drinks routines which are omitted are upsetting for residents as well as being a missed opportunity for drinking[128]. For residents, who do not like to ask for drinks, knowing that a drink will be served at certain times is reassuring and the same for family members, who worry that their relative may not be drinking enough. Staff, too, also appreciate the benefit of routines by knowing that either they, or their colleagues, are responsible for ensuring that residents are being served drinks at certain times. It could be argued that this task-orientated approach to serving drinks is incompatible with person-centred care when a resident may not want drinks at certain times[241], but this would have to be considered alongside the way in which residents do not readily ask for drinks and prefer to wait to be served, and therefore the person-centredness would be the way in which drinks are served, and what kinds of choices are offered and provided. Whether the drinks that are being served are being drunk is a related, but different issue.

Facilities for residents to make their own hot drinks have already been described in relation to hospitality (section 6.5.3.1). In this section I describe how residents access their own drinks.

Staff in Group-4 described their 'life-skills area' where residents could make themselves a cup of tea. As this was a home caring for people with dementia, I asked about how they balanced the risks associated with making hot drinks with the ability to provide this facility. Staff agreed that there was a risk and so there was always somebody allocated to the area, although it did not seem to be well used:

> **Avril** *"A risk. We have to… there's always somebody in the life skills area. We have to obviously watch the kettle. […] Not many people make themselves a cup of tea."*
>
> Senior staff, Group-4

Senior staff in the Group-5 (also a dementia home) talked about a different health and safety issue when they had bought a drinks dispenser for residents to help themselves to cold drinks, but it had to be abandoned because residents had dismantled it and its contents had gone all over the carpet:

> **Sally** *"Water bottle upside down you could dispense cold drink from, […] more juice on the carpet […] but you do get the residents that do like to take things apart!"*
>
> Senior staff, Group-4

In both these quotes, the dilemmas faced by staff are apparent as they try and make drinks accessible, but they needed staff to enable this by monitoring the facilities to ensure that residents were not harmed as a result of them.

6.5.3.7.2 Reaching drinks, remembering to drink and recognising drinks

Whilst residents made positive comments about the amounts of drinks they received, they made no mention about any difficulties reaching drinks, but this may be because all residents reported having no such difficulties on the short questionnaire I asked them to complete prior to the focus groups, and they did not talk about this issue in relation to any other residents. The staff were aware about leaving drinks within reach and both staff and family members talked about putting cups in residents' hands and prompting them to drink, especially if they had visual or cognitive difficulties so that they recognised that they were being given a drink, as Sandy explained when he told his wife that he was offering her a drink before putting it in her hand:

> **Sandy** *"They're very good at bringing drinks round on trolleys, […] you can put the glass down […] but Dee wouldn't know she's got to do that [i.e. take the glass and drink from it].*
>
> *'Would you like a drink, dear?' and then I can put it in her hand."*
>
> Family, Group-8

Sandy went on to explain that some carers were more mindful of his wife needing this kind of assistance than others, and that this was a concern for him.

6.5.3.7.3 Choice of cups

Accessibility to drink via the receptacle in which it is served is a crucial component of the process of drinking which can enhance or detract from the experience. Many people have a favourite cup/mug/glass and consciously avoid others when able to make that choice. Choice may be for purely aesthetic reasons, or for more practical reasons, such as size of cup, ease of holding, thickness of the rim, distinctive cup (to avoid confusion with others). One resident reminisced about her own glass and cup at home:

Betty *"I always used to have my own cup and also my own mug and glass."*

Resident, Group-1

Betty then went onto describe the tea service in detail and how it was a present from her grand-daughter. When asked directly about whether she had any choice about cups now, she said not and then Freda joined in the conversation moving it straight back to reminiscing about favourite cups and ways of drinking:

DB *"Is it possible to have your own cup now? "*

Betty *"Not really."*

Freda *"I think when, when you're mum and you're dishing up for the family, each person does really have their own cup, even though they all look the same in the tea set. There's something about each cup that a person goes straight for that one and I know which one it is for the each one of them, so put it at their place."*

Residents, Group-1

Freda described how, as a mother, she knew whose cup was whose, even if they all looked the same, and she made sure she gave the right one to the right person. She seemed to indicate that it was part of her role to ensure that she should look after her family in this way, ensuring that each member had food as well as their particular cup. This manner of attending to their family's needs was described by Lupton as being very typical of how women, as wives and mothers, provided food to nourish their family both physically and emotionally[238].

Later on in the same focus group, Betty described how she was involved in choosing a new tea service (section 6.5.3.7.4). This was the only instance that residents talked about being offered any kind of a choice of cups from which to drink. A choice of tableware was not something that staff talked about unless they perceived that there was a difficulty, with both staff and family members remarking that any preferences about drinking from a cup for aesthetic reasons was secondary if residents needed a drinking aid, as Gwen pointed out regarding her mother:

Gwen *"I don't think mother really likes drinking out of it but unfortunately she hasn't really got that choice because she's lost the mobility in her shoulders as well […] so once that's put there, which is ideal, she can pick it up with the handle, you know, both handles."*

Family, Group-8

The greater independence of residents in Group-3 and the way in which they made their own drinks, also meant that they chose their own cups.

6.5.3.7.4 Holding cups

For residents, the main point of discussion regarding accessibility was the types of cups and glasses that drinks were served in. The cups provided by the care home did not seem as though they were always suitable, being described as either difficult to hold or too heavy. For cups, handles were often described as too small, so either their fingers touched the side of a hot cup, or if they held it with two hands it was the same problem, as pointed out by Betty:

> **Betty** *"It's ever so difficult for me because I've got arthritis in my hands […] they touch the cup when it's hot. […] The handles are a bit small."*
>
> Resident, Group-1

And then Terry:

> **Terry** *"Now I would have a problem drinking with that cup." [talking about another participant's cup]*
>
> **Coral** *"You would, yeah."*
>
> **Terry** *"Because I can't get m'hands up properly, so you need to tuck your fingers underneath the handle, if you know what I mean?"*
>
> Residents, Group-3

When talking about this, Terry demonstrated how he held his cup using two hands, a common method if there are difficulties, which was described by other participants too. Another problem area discussed by residents at two of the groups was the thin, disposable cups supplied with water coolers (Drinking Vessel 4, Figure 6-1) which squashed very easily when held by people with a weak grip, so spilling the water and causing embarrassment and extra work for care staff, as two residents pointed out:

> **Coral** *"If you squeeze gently that'll come out…"*
>
> **Terry** *"Because you can't hold 'em like normal people, no, and you could just pick it up and drink out of that, but no, even I have a problem, the minute you pick them up… because you can't hold it in the same way…."*
>
> Residents, Group-3

Residents did not actually say that they avoided drinking from water coolers because of this, but it was obviously a cause for concern. Whilst describing his difficulties with the water-cooler cups, Terry associated himself with not being ‘normal’ because he could not hold cups in the same way that other people could. I am not sure if he felt that this was a stigma, but this is discussed further in section 6.5.3.7.5.

In Group-1 there was a similar discussion about the cups provided with water-coolers and residents remarked that they liked the glasses that I had taken in (Drinking Vessel 5, Figure 6-1), not only because they were easier to hold, but by seeing the water, that in itself was inviting and so far better than a beaker:

> **Zak** *“I like a glass like this, I can get hold of them and that holds a reasonable amount. […] Nice and heavy and solid.”*
>
> **Freda** *“There’s something about the glass, because you can see the water and you think, ‘Oh yes, I’m thirsty.’ And you pick it up and drink, whereas if it’s in a cup or a beaker or something, you don’t see it. It can stand there for ages.”*
>
> Residents, Group-1

The glass Zak was talking about was robust, had angles making it easier to hold, and was not too large (180mls). Although Zak commented that he liked the particular glass because it was heavy and solid, several participants reported that heaviness of cups was a common area of difficulty, as illustrated by Coral:

> **Coral** *“Well, because I can’t hold very well with these fingers, I don’t like heavy cups.”*
>
> Resident, Group-3

Coral then picked up the cup she was drinking from to illustrate that her particular cup was manageable although she avoided the handle as it was very small, ‘cupping’ her hands around it instead (Drinking Vessel 3, Figure 6-1). I had taken in a selection of cups of different sizes and different handle sizes to provide refreshments and also to use as a talking point during the groups. Whilst I offered a choice of drinks, I did not actually offer a choice of cups, but I would be very conscious about doing that now, having listened to many of the comments made. In the same group, Pearl was happy to say that she used melamine cups, because they were lighter.

There was consensus amongst staff that they were aware that residents found some cups too heavy, but in contrast to what the residents were saying, they did talk about how they addressed that, either having a choice of cups, using plastic beakers or filling cups half-full, as Pat described:

Pat *"So if you give them a small one, half a cup of that, well, they could have two or three of those and they can manage it themselves, which is always best, if you can encourage them to do it themselves."*

Senior staff, Group-5

Pat pointed out that it was acceptable to have two or three smaller cups (the equivalent of one larger cup) if it meant that residents were able to manage themselves, especially as they knew that serving drinks in inappropriate cups created further problems, as pointed out by Pat and Sally:

Sally *"The volume of fluid in them [i.e. smaller cups] isn't so great. They're lighter, they can hold it and, I think above all else, we try and retain that little bit of independence for them […] two or three of those, as opposed to a great big, ceramic mug that they just can't lift, they've got a whole other world of things that can go wrong!"*

Olive *"And try and identify those who really are not managing, who routinely, all that drink is over them and then say, look we have to intervene."*

Senior staff, Group-5

Staff in this group wanted their residents to maintain independence, and seemed to be aware that stepping in and making an adaptation in response to changing needs was essential.

In Group-4, Alex, whilst recognising that heavy, solid cups were less easy to knock over, nevertheless suggested that the standard cups and glasses they used in their home were too big and heavy. It seemed that she was using the focus group as a means of making this point, especially as she repeated the point later on in the discussion. Like Zak in Group-1, Alex seemed to approve of the glasses (Drinking Vessel 5, Figure 6-1) I had supplied for refreshments:

Alex *"The glasses we have are actually quite tall and quite heavy, which can be a bit cumbersome for some of our folks, […] these are a nice size, a bit smaller than we've got here."*

Senior staff, Group-4

Another home seemed quite proactive in making changes to help residents, as Betty described because she had been involved in the discussions around choosing a new tea service for the home:

Betty *"They came round and they showed us one and we all had to hold it and tell them did we feel it [was] comfortable.*

Resident, Group-1

When the new tea service was introduced, Betty seemed to prefer the newer cups, but they were being used alongside the old ones, which she could not manage so well, but she did not like to ask for her tea to be served in the new cup, first of all saying that she did not have a choice, but then she modified that to say that she could choose if she wanted to, but then she provided a reason as to why she did not choose:

Betty *"You don't choose. Mind you, you could do, you could say […] 'can you give me a white cup?' but it's a case of they might not have them – they might have been given out, you know, before they get here."*

Resident, Group-1

As discussed previously (sections 6.5.3.4.1, 6.5.3.5, 6.5.3.7.3), Betty modified her preferences and adapted. A similar description of how staff had been proactive in trying something new was the way that staff in Group-6 had introduced red cups after watching a programme on television about how people with dementia had poorer eyesight:

Aya *"We did start with one of these red cups at night times, so they could see them, but they haven't really, they haven't really worked, have they?"*

Bea *"They don't like it, no."*

Aya *"They don't like it, it's so big to hold."*

Bea *"On a film on dementia that's what they said was good to do, that's why we done it. We tried it."*

Aya *"Yeah, we did."*

Bea *"But it didn't work that, not in the end."*

Carers, Group-6

Unfortunately the red cups they had chosen were difficult to hold, and because of this, red cups were seen as not working. A small study in the US had shown that using high-contrast red cups increased fluid intake in nine men with Alzheimer's Disease, compared to using white cups[176]. Despite it being such a small study, it is well-known, and I suspect it is the simplicity of it which appeals to people, as it is very easy to try out at minimal cost or risk.

Inappropriate cups seemed to be a problem recognised by residents, families and staff, as there were several discussions about it, but dealing with and addressing the issue did not seem to be straightforward, with a number of snags being described.

6.5.3.7.5 Drinking aids

Some people require cups with appropriate adaptations if they are experiencing difficulties with standard tableware and there are a number of these drinking aids on the market. They are seen as a way of enabling a person to continue drinking independently and without the embarrassment of spilling drinks. However, just by using them is a visual signal that the person is having difficulties and as many are plastic and look like cups provided for young children, many people dislike using them, seeing them as stigmatising. With these thoughts in mind, this was an area I wanted to cover, but knowing that it was a sensitive topic, I tailored my approach. For all the groups, I used the cups and glasses I had taken in to provide refreshments as a means of talking about different cups and any difficulties they may cause (Figure 6-1); for the staff and families' focus groups I took a bag of different drinking aids with me (Figure 6-2). I displayed them at an appropriate time during the focus groups, when it was relevant and fitted in with the discussions. I had purchased them from a local shop supplying disability aids as well as from an internet site which I found using a simple search term ('disability aids'), so I did not have any specialist access to suppliers, having the same access as anyone else. In every group there was surprise at the range and the different types, as discussed by the staff in Group-7:

Gail *"We've got nothing quite so similar."*

Sara *"Similar, but not so posh!"*

Ada *"Oh no, I haven't seen those." [referring to Drinking Aid 2, Figure 6-2]*

DB *"It's quite good if you have arthritis."*

Sara *"Yes, it's good for Room 14 isn't it?"*

Carers, Group-7

Bringing the aids out in this group brought all three participants into the conversation, even Sara, who did not tend to say much. In Group-4, Tia, who also did not say much, joined in when I displayed the drinking aids. In all the groups where I used the aids, participants handled them, passed them around, related them to specific residents and their particular needs, and discussed their pros and cons, as the staff in Group-4 did, when examining the ‘Hydrant’ (Drinking Aid 1, Figure 6-2):

Avril *“This is good, I can think of someone who would like that!”*

Alex *“The one with the tube?” [laughing]*

Suki *“For somebody who hasn’t got dementia, something like that, how would you then get them to suck, if that makes sense, something like that?”*

Senior staff, Group-4

This particular aid (‘Hydrant’, Drinking Aid 1, Figure 6-2) had recently received some publicity for winning the Queen’s award for Enterprise Innovation in 2013[242] as a way of helping hospital patients to drink more as it clips onto the back of a chair or bed and patients have constant access. However, it relies on residents remembering that it is there, what it is for and that they are able to suck, hence Suki’s remark about its general usefulness in people with dementia.

Most staff and families recognised the most commonly used aids (Drinking Vessels 3,6,7,8, Figure 6-2) and those participants who were health professionals recognised some of the more unusual aids and were able to describe the circumstances when a particular aid may be appropriate, so I was surprised when other staff appeared not to have come across some of the aids before, and also by Avril’s comment:

Avril *“We tend not to [use aids] unless they need to. They’re quite clinical, aren’t they?”*

Senior staff, Group-4

Avril made this comment whilst the aids were being passed around, and following her previous comment in the preceding quote and despite it being obvious from the discussions that they *did* use aids in their care home, as staff were picking them up and relating them to specific residents. I think her reluctance to admit that they were using them related to her views about her care home being seen as a ‘home’, which she had expressed on a number of occasions, and using drinking aids would detract from that view. This also illustrated the way in which the stigma of using aids was felt by staff. In Group-6, where staff cared for residents without dementia, I asked whether they thought residents minded using aids:

Bea *"No. I ask, you know, if they can answer, I say, 'Would you mind?'"*

Aya *"I'd like to see more different kind of cups…"*

Cat *"I think they realise they can't do it themselves…"*

Carers, Group-6

Unfortunately, the three staff participants in this group were talking over each other at this point, and although I managed to get the gist of what they were saying, I missed some of the detail. It seemed that Bea did not think that residents were keen to have aids, hence her polite approach, Aya would like more choice of aids, and Cat liked to think that if residents could not drink independently, then they would accept the need for drinking aids (a view held by family members too). This exchange was the only time in any of the staff groups where staff made any reference to the process of how they decided who needed aids and how a particular aid was chosen for a particular resident. The decision-making process of how, when and why residents began to use drinking aids, and how the particular aid was chosen for a particular resident was not discussed during any of the focus groups.

Staff and families discussed other tensions around using drinking aids and about balancing different needs: on the one hand drinking aids enable a resident to drink independently, safely and without spilling drinks, but on the other hand, residents may be drinking from a cup which they dislike, so diminishing the experience of drinking, and using a drinking aid may be stigmatising for residents who may feel that they are losing their dignity. In Group-4, Una referred to some of these tensions, and in doing so, she contradicted Alex, who was trying to say that she would like to see a greater choice of glasses (for the second time, having previously suggested it):

Alex *"I would like to see a choice of glasses […] have smaller tumblers."*

Una *"We do have a few smaller tumblers!"*

Alex *"There are not many of the small ones, are there?"*

Una *"No, but the ones that need… […] we try and make it easier for them. If they can't deal with the glass then, although it would be nice to have smaller glasses, but we'll give them a plastic one 'cos it's lighter and the two-handled ones, so I think we try."*

Senior staff, Group-4

Una hesitated several times, started a sentence, left it unfinished and started a new sentence as she tried to explain that they did have smaller glasses and that the staff were trying to do their best for residents with the cups that they had.

Family members, although aware of some of these dilemmas regarding drinking aids, felt that the need to drink was of primary concern, and being able to drink independently and safely outweighed any negative associations with drinking aids or plastic beakers, which were secondary, as Gwen pointed out about her mother who drank from a plastic beaker with two handles:

> **Gwen** *"I don't think mother really likes drinking out of it but unfortunately she hasn't really got that choice […] so once that's put there, which is ideal, she can pick it up with the handle, you know, both handles."*
>
> Family, Group-8

This pragmatic approach to the use of drinking aids has been reported on by other researchers, including Gibson's exploratory study of the use of assistive technologies in everyday life for people with dementia[243].

In the families' group, Frankie talked about how her father had a plastic feeder cup, which she talked positively about as he did not spill drinks even if he fell asleep holding it, but if they were having a cup of tea together, he would try and drink out of her cup because it was 'normal':

> **Frankie** *"When I'm with him, and I've got a cup of tea there, he'll go for mine because it's normal, […] he'll drink out of his feeder cup when nobody's with him."*
>
> Family, Group-8

'Normal' was a word used on a number of occasions by residents and family members, and seemed to indicate a change in abilities resulting in the resident no longer being able to use a cup in the way that they perceived most people should. Staff tended to describe these changes in other ways, using jargon or non-prejudicial language, such as when Una described how they mapped people with dementia at the dining table (section 6.5.3.9).

Staff and families talked about reaching a point when dignity was a secondary consideration, although there seemed to be a reluctance about coming to this viewpoint. So although Sandy explicitly stated this, at other times he talked about trying to maintain his wife's dignity:

Sandy *"We're beyond the dignity thing, really. It's just actually physically keeping her hydrated."*

Family, Group-8

And then, later in the group:

Sandy *"She does manage with a straw but she can manage with a glass and as long as she can manage with a glass, I want to keep that dignity there. Like I wouldn't necessarily want to be using this [i.e. a drinking aid] unless it was all going down her front, because she's probably, she's still aware she's got the glass in her hand and it's like a link back to normality."*

Family, Group-8

Again, there was the reference to 'normality', but Sandy is trying to deal with the dilemma of maintaining his wife's dignity, trying to help her stay in control and protect her from being humiliated or embarrassed, but at the same time ensuring that she drank sufficiently.

Use of drinking aids was not discussed in the first two resident groups, except to say that they were available for those that needed them. However, in Group-3 I had taken along a 'UEA' recyclable cup with a lid, used by staff and students to purchase hot drinks (Drinking vessel 1, Figure 6-2), this was brought into the conversation when talking about cups breaking, and was misconstrued by Louie:

Co-F *"I've got a solution to breaking cups. Look!"*

Louie *"Oh, right, is that a baby's beaker?"*

Resident, Group-3

Louie immediately assumed it was a baby's beaker, possibly because it was plastic, highlighting one of the problems associated with drinking aids, but as this conversation continued, Terry pointed out other problems of this type of cup and the importance of using such cups appropriately:

Terry *"But some people they'll use them then they choke themselves because they use them and they shouldn't do. That's why you're better off with an ordinary cup. I can't use one of them."*

Resident, Group-3

Terry was one of the few participants in any of the groups to recognise that drinking aids themselves could cause problems, so had to be selected carefully.

Plastic cups seemed to be disliked by most residents, although not all, as the following quote shows:

> **DB** *"How do you feel about them being plastic, does that….?"*
>
> **Terry** *"No, that don't bother me, no."*
>
> **Louie** *"I wouldn't like plastic."*
>
> **Coral** *"No, no I wouldn't, definitely not, no."*
>
> **Opal** *"Oh I hate it, can't bear it on my mouth. Plastic's the last thing I want to drink out of!"*
>
> Resident, Group-3

Later in the group when talking about the heaviness of cups, Pearl stated that she had chosen melamine cups specifically because they were lighter and she only ever drank cold drinks, so she was happy to use them. It is possible that melamine was acceptable in Pearl's case as she had chosen to use them, rather than having them imposed on her.

Staff and family members talked about using plastic beakers because they were a practical and accessible solution to the problem of heaviness, and offset the dangers of breakages inherent in glass and china, but this was not ideal, as Avril pointed out:

> **Avril** *"And there is a lady who bit into glass, wasn't there, so we got her a small… we don't like plastic cups because, as I say, it is a home, it's quite institutionalised but with her, she might, the risk if she might bite the glass, so she has a plastic cup, like this, doesn't she, without the top."*
>
> Senior staff, Group-4

As with using drinking aids generally, using plastic cups seemed to cause a dilemma for Avril, because she liked to think of the care home as a 'home' and as such, plastic cups are rarely used by most people in their own homes. However, for this lady, Avril had to compromise her views, as glass and china had obviously become a danger.

Staff in Group-5 described the benefit of using a beaker with a spout so that the sensation on the residents' lips would alert them that a drink was forthcoming, and they would then start to drink:

Sally *"And sometimes they just can't manage a normal glass so we have spouts that we would fit to the glass and they find that a little bit easier to just have a small opening, as opposed to a full glass. They don't recognise the fact that the glass is on their lips and to close their mouths, but they will with the spout or a straw."*

Senior staff, Group-5

Family members and staff talked about using straws as an alternative kind of drinking aid, and less obvious than aids per se, but residents needed to be able to suck to use them.

Two participants mentioned using spill-resistant plastic sports bottles. These types of sports bottles are widely available, but seemed to be used rarely in care homes. This may be because they are used more by younger people, but even so, residents who may benefit from them may feel less stigmatised as a result, as these products would fall into the category of 'universal design' described by Parette and Scherer as the way in which products are designed to be used by all members of a society, regardless of age or disability, so diminishing issues around stigma associated with particular types of products[244].

The discussions around drinking aids highlighted a number of contentious issues, not all of which were explicitly stated. The issues highlighted in these discussions were those of stigma, dignity, safety, promoting independence and seeing the care home as a home, rather than an institution. Stigma and dignity are closely related terms, with stigma being defined by Goffman as 'spoiled identity' to describe how people feel when they did not have full social acceptance[245] and dignity being described as:

> *"The way people feel, think and behave in relation to the worth or value of themselves and others. When dignity is present people feel in control, valued, confident, comfortable and able to make decisions for themselves. When dignity is absent people feel devalued, lacking control and comfort. They may lack confidence and be unable to make decisions for themselves. They may feel humiliated, embarrassed or ashamed"*[246]

Feelings of stigma and dignity are tied up with other people's attitudes and so have a socio-cultural context. For the resident, using a drinking aid is a visible sign of their difficulty, signalling that they are different ('not an ordinary person'[244]) and engendering feelings of low self-esteem. This view may result in many people choosing to avoid using a drinking aid[244].

Pritchard and Brittain suggest that ageing and its associated dependency are stigmatising and this is increased by the use of assistive technologies which aim to improve independence and quality of life[247,248]. Whilst the majority of staff and family members viewed drinking aids as a way of residents remaining independent if they were experiencing difficulties with standard crockery, some participants provided insights into the way in which using assistive technologies in this way could be stigmatising. Although none of the participants used the term ‘stigma’, I felt that stigmatisation was being referred to when certain words or phrases were used, such as ‘normal’, ‘loss of dignity’ and the way in which one carer described drinking aids as ‘clinical’. These attitudes contrasted with those of other participants who thought that promoting and maintaining independence, and minimising risk associated with spillages were the priorities and an essential part of carers’ roles. It has also been suggested that carers have an ethical responsibility to ensure that residents retain their autonomy to eat and drink in a supportive and respectful manner[249].

6.5.3.8 Drinking practices relating to micturition

Drinking and micturition are linked as micturition is the body’s way of eliminating excess fluids. As such, it is common for people to restrict their fluid intake if access to toilet facilities is limited or their ability to access the toilet becomes painful or requires assistance. Anxieties about going to the toilet are the most widely perceived reasons as to why people limit their drinking, particularly in the evening, to avoid getting up to the toilet at night[87]. This was certainly the view of many residents, but not all, as illustrated by Mavis, who said she did not worry, and then Opal who did:

> **Mavis** *“If you want to get out and can’t get out, you just ring the bell, so if you’re thirsty you just drink. I don’t restrict myself.”*
>
> Resident, Group-2

Not only was Mavis not worried about getting up in the night, she was also not concerned about ringing for assistance, something she stated a few times during the focus group. In contrast, Opal explained that, in line with the rest of her family, she did not drink after 7.30pm. When I pressed her to expand on the reason for this, Pearl teased her by providing the reason explicitly:

Opal *"Our family make half past seven the limit – can't drink, they don't drink after half past seven."*

DB *"Why is that?"*

Pearl *"So's you don't wet the bed!"*

Opal *"Because they don't want to have to get up in the night."*

Residents, Group-3

This exchange took place near the end of the focus group. Opal had tended to talk at length during the focus group, and seemed to irritate some of the other participants by doing so, so Pearl's comment about wetting the bed may have been due, in part, by being irritated by Opal.

Staff were aware of residents' reluctance to drink because of anxieties relating to micturition, and accepted that many residents reduced their drinking in the evening to prevent getting up in the night, as well as to avoid asking for assistance, as Tia explained:

Tia *"They do worry about it, especially sort of in the evening time. They say, 'Oh, not now. It's too late. You know, I'm going to go off to bed soon and I don't want to get up in the night and bother anybody.'"*

Senior staff, Group-4

However, no-one talked about increasing fluids at other times of the day to compensate for diminished drinking in the evening.

Where staff thought that residents' worries about drinking were misplaced, they described how they advised residents, as Cat explained when talking about a resident with a catheter and how he needed to drink:

Cat *"I think if you talk it through with them, […] he was so adamant, 'I'll do what I like and I don't drink,' […] 'you **have** to drink because of your catheter now in place.' And now he realises that's helping him."*

Carer, Group-6

This quote showed that residents with catheters also had anxieties relating to micturition, and that these worries are not confined to residents who need to physically use a toilet or who are incontinent and wear pads.

One of the residents, Betty, related the way in which one of the carers provided advice about how drinking more would help her go to the toilet by training her bladder:

Betty *"I was having problems and the doctor was going on to me about my intake of water and everything. […] She said, 'you can train your bladder,' and you jolly well can!"*

Resident, Group-1

Discussing issues around micturition may have been embarrassing for the residents, especially as two of the three resident groups were mixed sex and in neither group did the men contribute to this part of the discussions. Betty demonstrated some of her embarrassment by muddling her words ('gritty nitties' instead of 'nitty gritties'), repeating herself and leaving sentences unfinished:

Betty *"Well, that is coming… now this is coming back to the gritty nitties [sic]. If I drink very cold… I do like water, I don't think I do drink enough, but I don't, I don't have anything either… but I do drink water because I have to have water with the medication and that's the reason why I don't drink very much at night, because, unfortunately, I'd have to keep getting up. "*

Resident, Group-1

In both the staff and resident groups, there were some noticeable use of euphemisms ('convenience', 'spend a penny', 'calamity', 'accident') and lowering of voices when issues around micturition were discussed, again indicating some possible embarrassment, although it seemed that when staff used these terms they were relating how they approached residents, indicating the way in which they were trying to alleviate residents' possible embarrassment rather than their own, as Bea demonstrated when she explained how she described to residents about going to the toilet when they were on an excursion:

Bea *"If you want to go to the toilet [said more quietly], I, we, us carers will help you just the same."*

Carer, Group-6

This quote was part of a conversation where staff explained that they had to spend some time planning and preparing any outings involving residents, making sure that residents knew they had thought about accessible toilets, carers would be available to help, that they could defer taking their water tablets and that the journey would be short. However, staff felt that despite reassurances and planning, some residents were reluctant to leave the home, having lost confidence.

In contrast, family members talked quite matter-of-factly about issues relating to micturition, in the same way as they did about drinking aids (section 6.5.3.7.5). Families described how all their relatives were totally dependent on staff for assistance (requiring a hoist in some cases) but they did not link the need for assistance with any decrease in drinking.

6.5.3.9 Environment, social and physical

The social and physical environment can have a substantial impact on drinking[250] and all participants (residents, staff and families) acknowledged the way in which the environment enhanced or detracted from the experience of drinking and that residents had places which they preferred or disliked to sit and take a drink. This is illustrated by Sandy, when he described taking his wife to the village hall for afternoon tea organised by a local organisation:

> **Sandy** *"When we walked into the hall I knew that wasn't going to work, I could feel her go like this [demonstrates tension]… all these women and tables!"*
>
> Family, Group-8

Sandy said he knew that this was not the sort of event that his wife would enjoy, so he went on to describe how he had taken her outside to sit on the lawn instead, where she drank three glasses of juice. In the same group, Frankie described how her father did not like to come out of his room, although she wished he would, as seeing other people drink around him may act as a reminder to drink:

> **Frankie** *"My dad being in his room, there was nobody else – you know, there is nobody else drinking and I think if you've got a group of people round a table and one drinks, then even if you're not completely with it, it may, you know, you may do it out of…" [talking over each other]*
>
> Family, Group-8

Frankie went on to say that for residents who stayed in their room (as her father did), staff needed to be more proactive about ensuring they drank well:

> **Frankie** *"I am certainly aware with my father that there is nobody, except the staff, going round once an hour and they may or may not encourage him to drink, so, y'know, I think once you have somebody who's on their own, you do have to pay more attention."*
>
> Family, Group-8

One member of staff commented that it was easier to monitor fluid intake for residents who stayed in their rooms, but otherwise they did not talk about these residents requiring more attention in the way that Frankie had pointed out.

In all the staff groups, staff described a number of scenarios to illustrate how they had used social experiences to encourage reluctant residents to drink, and in one home they provided staff with free meals if they sat and ate them with residents. Eating and drinking with residents was described as common practice by the senior staff groups and a carer also talked about doing this:

> **Ada** *"We've got a lot more time, on the whole […] we have a few that go to bed quite late and we have like a little picnic and drinks in front of the telly.*
>
> *[..] If you give her a drink and sit down with her and make it like a social event, then she drinks more."*
>
> Carer, Group-7

As a night-carer, this carer felt she had more time to do this than day-staff. At the same home, one of the other carers, said that she was too busy to take part in these kind of activities, and other frontline staff only talked about eating and drinking with residents if they were helping out with organised activities. These discussions seemed to imply that frontline staff did not seem to feel as able to sit and drink with residents as senior staff.

In addition to residents drinking more in socially acceptable situations, there may be other benefits, as described by Alex:

> **Alex** *"There was a lady who'd just come out of hospital, […], and she wouldn't come out of her room, so we actually had a coffee time in her room and invited another resident to come in and that way, everybody drank!"*
>
> Senior staff, Group-4

In this case, the resident appeared to have lost confidence, so Alex used hospitality and drinking together in a known environment (the resident's room) to try and provide the resident with a feeling of security. The negative impact of hospitalisation on residents with dementia was reported on by all the staff and family groups and is discussed further in section 6.5.4.7.

Another aspect of the social environment is the impact of other residents' behaviour and table manners. This can be positive, as Sally described:

Sally *"I think sometimes it's watching who they're sitting at the table with, as well, you know. Sometimes it's just copying."*

Senior staff, Group-5

Alternatively, it can be negative where some residents may find the eating and drinking habits of other residents unpleasant or distressing. This negative aspect of the social environment was only discussed in the staff and family groups, and not by the residents at all. Senior staff groups talked about 'mapping' residents, trying to ensure that any distress was minimised, as Una explained:

Una *"[…] if you've got someone with very severe dementia and then someone with not, you know, very slight dementia, they can be put off by the way the person's eating, especially if they drip, drop food or anything, so I think that, that's a… you know, we do try and map people."*

Senior staff, Group-4

Una hesitated and repeated herself at the beginning of this quote, and seemed unsure about how she was going to phrase what she wanted to say in a tactful way.

One family member talked about how his wife disliked being with other people, and he thought that it was because she did not like seeing their behaviours:

Sandy *"My wife's the same […] she will come down here if they put her in a wheelchair, but she doesn't like being with these other people because she could see, maybe, that they're not quite normal, […] she doesn't know that she's got dementia."*

Family, Group-8

Sandy made this comment about his wife after Frankie had remarked how her father preferred to stay in his room so illustrating some of the ways in which families compared and shared experiences. In the next sentence, Sandy changed the subject completely, relating an anecdote about how he often joked and chatted to his wife's neighbour in the next room as she rarely had visitors. Changing the subject so abruptly seemed as though Sandy was finding it hard to talk about his wife's dementia, especially as he used the phrase 'not quite normal'. Earlier, Sandy had described how his wife's own table manners had changed and she now ate with her hands, but he felt that at least she was eating at that stage.

The only reference residents made to unsocial manners was the discussion in Groups 1 and 3 about spilling water served in the plastic cups which came with water coolers (section 6.5.3.7.4).

One reason why unsocial manners may not have been discussed more fully may be because residents may have considered it impolite to talk about other residents' lack of social graces. Another reason may be because it could be a sensitive topic for many residents, aware that their own physical and cognitive abilities may be declining and so perhaps becoming less adept at maintaining the social and physical skills required to eat and drink in a socially acceptable manner.

Although eating and drinking together socially is associated with increased consumption[250–252], and staff and families were aware of this as they talked about it, the effectiveness of social facilitation depends on the type of relationship between individuals[251,252]. So that whether social facilitation remains valid for residents who either have poor table manners, or who sit with others who have poor table manners, needs further exploration. Sidenvall[253] and Manthorpe[254] both described how table manners are culturally determined and that eating with people who have eating problems may be distasteful, distressing and result in a decreased appetite for some; for the person whose table manners are deteriorating, this may lead to shame and guilt[241].

The impact of the physical environment on drinking was not acknowledged quite so widely as the social impact. Residents certainly described the places where they preferred to sit, but it did not seem as though this had anything to do with enhancing or diminishing the experience of drinking:

> **Betty** *"Some people like to stay in their bedroom for a while. I don't because you feel shut in and you get down here and you see life and people around."*
>
> Resident, Group-1

The only staff group who talked about physical aspects of the environment, described sensory aspects and the number of lounges they had for residents to choose where they sat, as illustrated by Tia:

> **Tia** *"We've got several lounges. […] If they want to be quiet they can go and sit quietly."*
>
> Senior staff, Group-4

Noise, busyness and sensory overload and its detrimental effects on the drinking experience were also recognised by the staff in Group-4 and they described a number of measures they had taken to address this:

Avril *"This morning I went into the dining room and they were cleaning the carpet and the residents were trying to have their breakfast and you could see them all doing this, [Avril puts her hands over her ears] 'Aagh!' […] and when I actually turned the carpet cleaner off they all applauded [general laughter]."*

Carer, Group-4

In the same group, staff described removing all unnecessary tableware and making the tables more attractive, both to minimise sensory overload and enhance the aesthetics of the dining area:

Alex *"There's a lot of thought about how the tables are laid. […] we realised there was too much on the table […] simplifying it is important."*

Avril *"It needs to look nice and pleasant, as well, doesn't it. […] fresh flowers on the tables, we have napkins, linen, er nice glassware.*

Senior staff, Group-4

Group 4 provided specialist dementia care and seemed to be aware that homely environments could contribute to supporting residents to be independent[255]. The positive and negative effects of ambience for people of all ages and situations was reviewed by Stroebele who concluded that a number of factors (including smell, noise, room colour, temperature) may all affect intake food and fluid intake, and that these effects may be under-estimated[250].

6.5.3.10 Costs

Costs of certain drinks were mentioned occasionally in some of the resident and staff groups, with one resident group linking the disappearance of the much-loved water-cooler to cost. However, on my return to that home a week later, it had reappeared! However, costs of drinks or supplying certain kinds or brands of drinks, was not described as a barrier by any of the participants.

6.5.4 Theme 2, 'Caring roles'

This theme describes how staff, residents and family members view their caring roles in ensuring residents drink well, how these caring roles are shared and the issues which support or hinder the conduct of these roles.

There was an awareness, particularly in the senior staff groups, of this responsibility, and that they, as staff, were accountable. Although the CQC (the regulatory body of care homes in England and Wales) were never mentioned by name by any participant, other areas of authority and scrutiny were, including mention of care home owners, health professionals, hospitals and the media.

The staff groups talked at length of their responsibilities to help residents drink and how they provided care, but so too did the families and residents. This section will discuss how each of the four groups of participants described their roles in meeting residents drinking needs, how these were shared between groups and the tensions and barriers arising when this was unsuccessful.

6.5.4.1 Residents' care needs

The need for care to ensure that residents have enough food and drink to keep in good health results from residents' declining physical and cognitive abilities.

For participants in this study, residents' physical care needs were attributed to five main issues: mobility (requiring assistance with fetching drinks or toileting care), arthritis (unable to reach drinks, hold cups or pain when getting up to go to the toilet), swallowing problems, sleepiness (missing or spilling drinks) and visual impairments (mistaking drinks or unable to see them). Residents, as well as carers, recognised their care needs, as Mavis pointed out when asked about how she would carry a drink she had made herself:

> **Mavis** *"No, I won't be able to carry it [i.e. a drink], not with my frame."*
>
> Resident, Group-2

Care needs for residents with cognitive difficulties related to dementia, where staff and family members described how residents forgot to drink, did not recognise their thirst sensation or link that with drinking, and neither could residents recognise that they needed to drink from the cup when a drink was served. Other difficulties related to communication, unsocial behaviours and fluctuations in behaviour, as Ada described:

> **Ada** *"They can't connect that they're thirsty. They can't connect that that is something to drink that'll ease that thirst. They just don't recognise any of it. […] You can't describe how to… you can say, 'Swallow' but it just goes over the top, it doesn't mean anything."*
>
> Carer, Group-7

Whatever their residents' care needs, staff and family members saw their caring role as essential in ensuring residents drank sufficiently and did not become dehydrated, as Gail pointed out:

> **Gail** *"I think, without doubt, I think every member of staff I'd like to think is aware of how important the drink side of things is."*
>
> Carer, Group-7

Caring responsibilities were obviously intrinsic to the care staff, and acknowledged to be so by residents and families. What was less obvious was the way in which residents contributed or wished to contribute to their own care, and how this was acknowledged by care staff. The involvement of family members in care was an area of contention for both the families and care staff, whereas for residents they described how their families provided advice and support.

6.5.4.2 Residents' roles in managing their own drinking in partnership with families and staff

Residents in all three groups saw themselves as having a responsibility for their own hydration care and some aspects of this were discussed in section 6.5.3.5 which described how residents managed their drinks preferences. In this section I discuss residents' contributions to their own care. A key part of this contribution is being receptive to advice, as Zak and Betty explained:

> **Zak** *"It's up to us, really to make sure we have enough water intake in a day."*
>
> **Betty** *"Yes, of course it is. […] It is up to us. They're helping us and it's up to us to go along with them, isn't it? […] She [i.e. one of the carers] will give you little talks about why you should drink water, you know."*
>
> Residents, Group-1

Zak and Betty were both appreciative of the help they were given.

Although staff talked about advising residents who were reluctant or unaware of the need to drink, there were no discussions about whether staff had any insights into the ways in which residents contributed to their own care. This is probably because staff from three of the four focus groups worked in dementia homes and so the residents in their care may not have been able to contribute to their care in the same way. Involvement of residents in their own care is another aspect of person-centredness, which is not just about choice, but ensuring that the resident is a key contributor to their own care[256]

The way in which residents involved family members in their own care was only discussed in Group-3. Two residents seemed to have daughters who were actively involved in their care and provided advice about drinking, as Coral explained:

> **Coral** *"My daughter is a specialist nurse, we've got bladder problems and that's her who recommended not to have tea or coffee unless that was decaffeinated. She said water is the best thing you could possibly drink. Because it [caffeine] could irritate your insides."*
>
> Resident, Group-3

Coral had already indicated at the beginning of the focus group that she would have preferred decaffeinated coffee when I offered her a drink and in this excerpt she explained why.

In addition to listening to, and acting on advice, residents also discussed monitoring their own intake, which is discussed in section 6.5.4.4.6.

6.5.4.3 Family members' roles as carers

The role of families in the hydration care of their relative was discussed by residents (see previous section), staff and themselves.

Staff expressed a number of different views about family involvement in their relative's care relating to the way in which:

- Families needed support.
- Families were supportive of staff.
- Families were involved in the care of their relative.
- Families did not wish to be involved in the care of their relative.
- Families were critical of their relative's care.

These were slightly different to the way in which families saw their roles. Families saw their roles as:

- A carer who was continuing to contribute to their relative's care
- A member their relative's care team.
- Carer with responsibility to ensure that their relative has the care they need and want.
- Their relative's advocate.

These views and roles will be discussed more fully below.

Being a family member of a resident can be distressing especially if their relative has dementia, or physical difficulties causing pain and requiring help with all activities of daily living. This distress was voiced many times by the families and it was recognised by the staff. One particular group seemed to be mindful of family members' distress at seeing their relative with dementia, as this extract demonstrated:

Sally *"Yes, yes, this is mum, this has been a strong person their whole lives, who in fact is now the one that needs care – it's gone full circle really, and they can't really get their heads around it, no matter how long it's been, they just can't."*

Pat *"And some people just will not accept that."*

? *"Yeah, it's too much."*

Pat *"This is not going to get better, this is a progress."*

[…]

Sally *"No, this is a person, and they may not like that new person that's developed. […] It's not up to us to judge anybody, y'know?"*

Senior staff, Group-5

Sally described how dementia caused changes in personality, to the extent that the person is unrecognisable as 'mum' to her children. This is distressing on two counts, firstly because these personality changes mean that 'mum' is not the person her children know and she has become someone that her children do not like and secondly, there is a reversal of roles where the children have become the carer's for their mother (who had been *their* carer). The staff empathised with the families about this, but this extract also showed, once again, how Pat and Sally were quite frank and explicit when describing dementia and its effects, much more so than other staff. Later on, in the same staff group, Sally talked about the limited support they were able to provide to distressed families:

Olive *"We currently have one or two families don't we, who are really struggling. They're not really understanding why there's other things happening."*

Sally *"They're just really sad. There's nothing you can do to make it better for them, just listen to them and perhaps give them a little bit of guidance, but that's really about all we can do, y'know, support them when they need it."*

Senior staff, Group-5

Staff talked about trying to involve families in care, but with mixed success, as Olive pointed out:

Olive *"One lady where her daughter, when she does visit (she's not able to get here very often), absolutely delighted to give her mum her dinner and give her a drink and to contribute to her care and yet another lady, her son visits her and [we] keep saying, 'Perhaps if you have a drink with her she might drink with you,' – won't do it. It's interesting, people."*

Senior staff, Group-5

In the families' group, the two participants whose relatives' needed help with drinking, seemed to be happy to do this when they visited, as Doris confirmed when I asked her directly:

DB *"Do you feel you have the skills?"*

Doris *"I find it quite easy."*

Family, Group-8

Doris was at ease with helping her relative to drink, but this obviously varied between people, as the staff in Group-5 had found.

In Group-4, staff seemed to be trying to encourage the families to participate in everyday care, whereas in the other senior staff group, their discussions around family involvement seemed to be more formal arrangements:

Alex *"We invite them to have lunch at certain times."*

Senior staff, Group-4

Later in this group, Tia talked about family meetings, and Avril, whilst agreeing with her, also pointed out that they had an 'open door' policy, but then went on to describe pre-arranged coffee mornings and afternoons:

Tia *"But you do have meetings, don't you, with the families?"*

[…]

Avril *"Yeah, we have an open door policy and the families can come to us. We have coffee… actually coffee mornings, coffee afternoons, where families come for a coffee and cake, so it's an informal discussion where, you know, things can be agenda-ed, you know, 'are you happy?'"*

Senior staff, Group-4

Staff in this care home seemed as though they had considered family involvement and had developed systems to support that, although they seemed to have a more guarded awareness of family involvement (staff in this group had also described an instance where families had challenged their care). This was in contrast to Group-5, where staff seemed to take a more empathetic approach.

Ryan, in an exploratory study of the experiences of family carers finding nursing home placements for their relatives, found that where staff were empathetic, this approach was more conducive to facilitating partnerships between staff and families[257].

In contrast to these tensions around staff/family interactions, senior staff also talked about feeling supported by families, particularly when there had been negative media publicity around care in care homes, as Avril and Olive described in section 6.5.4.7.

The frontline staff seemed to have a different relationship with family members, compared to senior staff, as they described more instances around day-to-day issues around drinking, such as when Bea wanted to know whether someone's daughter had been bringing in red wine (section 6.5.3.6.2).

Discussions in the family members' focus group provided quite different insights into how families perceived their role and the way in which they saw their relatives' care needs for drinking being met.

The families talked about their current and previous roles as carers. Sandy seemed to be the only family member who had provided all care for his relative at home until he was no longer able to cope and his wife moved into a care home. Participants empathised with him about the difficulties of making that decision, but being responsible for all his wife's care needs for so long, Sandy found it hard to relinquish these to the care staff, despite recognising that he could no longer do it himself. Whilst he continued to provide some care where he could, the staff now provided all the care that she needed. Sandy was concerned that there may be shortcomings in his wife's care and he found himself being excluded from knowing what was going on, despite trying to talk to the staff to find out:

Sandy	*"I'm always talking to them, 'Gosh, she was very thirsty. Did she drink anything this morning?' They say, 'Well, yes, she's had two glasses.' And I just think, well, she's knocked 3½ of those back and she'd probably, in the old days, probably wouldn't drink that much all day, apart from a tea and a coffee, and she's like, really sort of [made sucking sound] desperate for it – another one and another one and then I just, I just… I have asked them quite a few times and they're sort of almost – not defensive, but it's almost like I'm attacking them and I'm not, but obviously, it's my wife."*
Gwen	*"Well, of course. I mean, you want the best for your relative, don't you?"*
Frankie	*"There's a balance between being too pushy and…"*
Sandy	*"Yes, absolutely."*
Gwen	*"Yes, it is."*
Frankie	*"…because you want to keep on the same side. You don't want to be troublesome. On the other hand, it is your relative and you do want to…."*
Gwen	*"… do the best for them."*

Family, Group-8

It is possible that Sandy's wife could have been drinking excessively as a result of her dementia, but whilst hyperphagia (increased appetite) has been described in people with dementia[258], polydipsia (excessive drinking) has not been described as a specific condition in people with dementia.

In addition to talking about his concerns about whether his wife was drinking enough when he was not there, Sandy, seemed to be describing how his role had changed from being the care provider, to being his relative's advocate, ensuring that she received the appropriate care, that is the care that he thought she needed and should have.

Sandy's descriptions resonate with research findings which have described how making the decision to move into a care home is difficult and once their relative is in the care home, the family carer has to redefine their caring role as they relinquish the day-to-day care to the care staff, but Nolan and Dellasega suggest that this redefinition of roles is left to the families to work out for themselves, rather than being assisted and guided by staff, in the way that was described by families in this focus group[257,259].

Other participants empathised with Sandy's concerns and Frankie pointed out that, as carers, they had undergone a change in role because they were no longer fully in control once their relative had moved into a care home:

Frankie *"I think the difficulty being a carer is that while they are at home, […] you can see what they're doing and you can issue your instructions; you have a sense of what's happening. When they're in the home, […] I don't have a sense of what's happening."*

Family, Group-8

Again, Frankie spoke very authoritatively, especially when talking about issuing instructions and she went on to describe some measures which Sandy could adopt.

Family members were mindful of their relationship with staff, as Sandy pointed out in the quote above, but because he knew that his wife needed to be reminded to drink, he was keen to know about his wife's drinking to make sure that she was being reminded, but his persistent requests for information were being seen as pestering. Frankie, empathising with Sandy, voiced this dilemma of how to balance her need to know against how often she could ask for that information as she explained:

Frankie *"A lot of the time they're fine and that's an issue with you, yourself. You know you've got no alternative but to trust them, but sometimes you just think, 'Is this alright? What do I do about it? How much am I interfering? How do I stir things up?'"*

Family, Group-8

Frankie was also aware of the limitations of care provision within a care homes, when an individual's needs had to be balanced against those of other residents. So although family members did not always think that their relative had all their care needs met in the way that they would like, they were also aware that there were many aspects of care, some of which were good:

Frankie *"And actually, they're looked after there very well, it's the fine tuning!"*

Family, Group-8

Families spoke positively about the way in which the care home notified them about other matters, such as health professional visits and felt that the staff communicated well on these sort of matters.

Previous research into the relationships between family members and care home staff reflect the findings of this study. Ryan described the decision to move into a care home as one of the most stressful decisions a person may have to make[260], which is often accompanied by a sense of failure, loss of control and disempowerment, together with feelings of sadness and guilt, despite the relief that the burden of care has been lessened[261]. Many of these feelings were described by the participants in the families' group. Sandy, as the only family member who had cared full-time for his relative, provided insight into how he struggled to adapt to his change in role from being the primary care-giver. Buckwalter and Hall describe the change in role as moving from the expert to being relegated to the role of visitor[262]. The family members' new care-giving role has to be redefined and negotiated with the staff[259,261], and again Sandy provided some insight into his experience of how he seemed to be creating some conflict when staff interpreted his concern as interference, creating an adversarial relationship[259]. In so doing, Sandy had moved into a monitoring role, evaluating the effectiveness and quality of the care his wife was receiving and stepping into the gap when he perceived that staff were failing[263]. Families' contribution to care has consistently been under-acknowledged, not only in this study, but in previous studies, with a number of authors concluding that a more collaborative partnership between staff and families would not only benefit the resident, but also the relationship between staff and families[257,259,261,263].

The other side of the coin, is the way in which staff feel that their care is not always fully acknowledged by families or that families have unrealistic expectations of what they can provide, especially when working in difficult circumstances[259]. In this study, staff reported that they found some families more willing to be involved in care than others, a finding also reported previously[264]. Nolan and Dellasega suggested that part of the care-staff's role should be to involve families in the ongoing care of their relative and that they should provide families with the support that they need to do this as it is part of their overall caring role, although this may be idealistic given the additional training and time these extra responsibilities would involve[259].

Regarding hydration care, supporting families' involvement and including them as key members of the residents' caring network would benefit the resident, especially when there are concerns about how much a resident is drinking.

6.5.4.4 Care home and care staff roles and responsibilities to support residents' drinking

Care homes and their staff have a responsibility to support hydration care which is regulated by the CQC and is reflected in the development of care home systems. Staff, family and resident views of these roles and responsibilities will be discussed further.

6.5.4.4.1 Staffing structure and support

Staffing structure and mutual support, in the way that was demonstrated by the participants in this study are one aspect of the organisational structures within care homes which may impact on the quality of care for residents[265].

All the staff groups talked about the staffing structure within the home, where the frontline staff provided the day-to-day care and they were supervised by senior carers ('seniors') who in turn deferred to the deputy manager and manager, who was then answerable to the owners. In each senior staff group a participant with managerial responsibilities was present, and during these groups each provided an insight into their more senior roles and how they differed from other senior positions within the home.

The 'seniors' were described as carers with supervisory roles. They took on extra responsibilities, such as administering medications, making operational decisions and liaising with families and health professionals. Seniors were the first point of contact for frontline staff and families, as Gail explained:

> **Gail** *"Either the seniors or the management would raise any major concerns with the families, so we don't get too involved in that, […] our concerns get fed to the seniors and management."*
>
> Carer, Group-7

Seniors also provided support for the frontline staff by being approachable and ensuring that there was always a senior 'on the floor' (rather than being in the office doing paperwork, for example). In addition to the formal structure and support system, staff talked about how they supported each other, in what was often described as a challenging environment in which to work:

> **Sally** *"Well in the first instance, we've probably got each other."*
>
> Senior staff, Group-5

As well as each other, senior staff talked about the support which came from other agencies, including visiting health professionals, who knew the care staff and the environment in which they worked, and close working relationships were developed between them:

> **Pat** *“We have district nurses that come in, who are, for the most part, lovely and you can ask them advice on absolutely anything. […]. So we’ve got quite a good backup system.”*
>
> Senior staff, Group-5

Receiving supportive comments from health professionals who knew them were valued by the senior staff and contrasted with the negative comments they reported receiving from health professionals who did not know them (section 6.5.4.7).

In each of the senior staff focus groups, those with managerial roles demonstrated their extra responsibilities in subtle ways, for example, one participant talked about how she had intervened in situations in a way only someone in a more senior position could, such as the way in which she described how she liaised with the owners for more staff:

> **Avril** *“We have to make sure there’s enough staff on, […] and we’re constantly reviewing that, aren’t we, because, you know, I’m constantly going to the owners saying there’s just not enough staff.”*
>
> Senior staff, Group-4

On another occasion a participant with a managerial role used the focus group to moot a proposed change in practice whereby staff should start to record how much of the drinks being offered were actually drunk:

> **Olive** *“We have like a list that goes with the trolleys and you tick off and make sure everybody […] is offered something. […] perhaps we ought to be recording what they’ve actually drunk, cos we, I, I think it and I, think, yeah, that’s a good idea, just think that would be quite difficult for us to practically do it, so I don’t think […], would we actually be able to cope with that as a group of staff?”*
>
> Senior staff, Group-5

This participant was trying to gauge the staff’s reactions because the change would mean a change in practice, so Olive talked about the change hesitantly. Participants in some of the other focus groups also used the groups to make suggestions and gauge the responses of the other participants about proposals or ideas (section 6.5.1.1.4).

Using focus groups to moot new ideas, as described above, may be examples of the way in which participants felt comfortable within the group situation, seeing it as a ‘safe’ environment to make suggestions, especially as I had talked about confidentiality at the outset. Kitzinger argued that focus groups can help participants to overcome inhibitions, especially when there is mutual support, so the fact that participants felt comfortable to do this may have indicated the supportive nature of some of the groups where this happened[224].

6.5.4.4.2 Staffing levels

Inadequate staffing levels were only commented on directly in the families’ group:

> **Sandy** *“They’re short-staffed at the moment, they’ve got two agency staff and the […] regular staff are not that happy with them because […] you get a different one every week […]. They [i.e. regular carers] know their people, don’t they?”*
>
> Family, Group-8

Sandy was concerned about agency staff being employed because there was a higher turnover of staff and as a result they did not know the residents as well as the permanent staff. By remarking on this, he highlighted how he felt it was important for residents to be cared for by carers who knew them.

The staff did not comment so directly about staffing levels. When this topic did come up, their comments were phrased positively, appearing to avoid being critical of the home in which they worked, such as Sally’s comment:

> **Sally** *“I think everybody could always say they could do with more staff, and realistically it’s manageable.”*
>
> Senior staff, Group-5

In a frontline focus group, Aya described how she had to abandon an activity she was organising about raising awareness of dehydration amongst residents due to lack of help:

> **Aya** *“And I didn’t have enough, I… because the activities sometimes on my own and I was like, ‘Oh, I didn’t have enough thingimmy’ but then I didn’t really carry it on and I didn’t really express to everybody else either, so it was my fault as well.”*
>
> Carer, Group-6

Aya did not finish her sentence, could not find the right word and blamed herself for not highlighting that she needed help in a way that seemed to be avoiding been seen to be critical of her colleagues.

Kayser-Jones, in her observational study of mealtimes, suggested that improvements in staffing levels and formal management structure would improve the quality of hydration care[266]. However, in a UK investigation of care home organisational structure and its impact on the general quality of care provided, no direct relationship was observed between increased staff and improvements in care quality, because of the interplay between organisational factors[211]. Killett et al also observed that agency staff can have both positive and negative effects on care; agency staff can add to the permanent staff's workload if they need help orientating to people and place, but there is also a positive effect in that they can bring with them new skills and experience[267].

The way in which staff were less overtly critical of the staffing levels than family members could indicate that there was no perceived problem or that feelings of loyalty had been engendered as a result of being valued. It could be argued that managers who were willing to host this study, permitting staff to participate (and for some this was in 'work time') had demonstrated that staff had been supported to take part. Staff may have then felt awkward to be overtly critical of their managers in front of colleagues, and this was apparent in the two frontline staff groups (where there were no seniors or managers present) as well as in the two senior staff groups.

6.5.4.4.3 Policies, practices and procedures

Policies, procedures and guidelines provide a framework in which care homes manage their care provision, to ensure their staff provide care to a recognised standard and which is auditable. On the whole, the staff in the senior groups seemed to discuss policies, guidelines and underpinning rationales more so than the frontline care staff, who tended to describe how they actually provided care.

All staff discussed the way in which dehydration was due to not drinking enough, and so it was seen as being preventable, and thus due to poor practice if it did occur, as Avril explained:

Avril *"We're very aware that, obviously, dehydration is a topic that could be seen as poor practice and neglect, so we are very aware that we don't want to get to that stage […] we're very hot on nutrition and dehydration."*

Senior staff, Group-4

This comment was made despite knowing first-hand how difficult it was to ensure residents did drink enough. There were several descriptions of policies aiming to reduce the risk of dehydration, many of which have been described already (routine drinks rounds, including drinking as part of social activities, providing choice of drinks and choice of places in which to drink). Other policies included:

- Increasing awareness for both residents and staff.
- Providing hidden fluids.
- Monitoring.

These will be discussed further in the following sections.

6.5.4.4.4 Increasing awareness for both residents and staff

Increasing awareness amongst residents about the need to drink, and usually to drink more than they had been doing, was described by residents in all groups, where they talked positively about how staff had provided advice and how they acted on this, with the exception of one resident who disliked the way staff had tried to advise her, but were not practicing what they were advising in providing adequate help for residents who were dependent on them (section 6.5.3.6.4).

Staff providing advice to residents was only discussed in Group-1, probably because this was a residential home where many of the residents did not have dementia. Even so, Aya still felt frustrated that her attempts to provide advice were often forgotten. Aya described how she used some information provided by the council to raise awareness about drinking:

Aya *"The local borough council give us some information about drinking from other research […] we get that out once a year to them and, um, have a big huge um poster on the wall to to say, you know…. [inaudible] but yeah, they are afraid, I think it's the toileting part that they're most afraid, but you know, you can say, 'Oh, the doctor says you've got to drink more,' or the district nurse, but they, they forget after a while. […] But that's like for us to keep, to keep mentioning it, of course. I won't just, sort of say, I won't bother because they don't understand. You have to keep, sort of, once a month, but yeah, yeah, it can be frustrating, and I find it abit…"[interruption]*

Carer, Group-6

Aya described how residents were worried about drinking more because they were anxious about going to the toilet, and also that raising awareness was constant as residents forgot or did not understand, although Aya wanted us to know that she persevered, however frustrating it was. Aya seemed very hesitant about what she was saying, and gave up when she was interrupted, although much later in the focus group, she returned to this topic, providing more detail. Aya was quite a bubbly person when I met with her before the group, but during the group she was quieter than I expected her to be. In fact, when I spoke to her following the group, she commented herself that she did not say much, but she did not say why.

In addition to planned sessions and gentle reminders, staff also provided advice opportunistically as well as backing up any external medical/nursing advice, using the authority of the doctor or the hospital as justification, as Aya did in the previous quote.

Staff in the other three groups, working in dementia homes, realising that explanations would not be appropriate, used other verbal approaches to help residents to drink, ranging from gentle persuasion, persistent prompting or even begging, as described by Alex (Group-4) and then Sally (Group-5):

Alex *"It's also tone of voice, isn't it, because if someone who's able you could actually explain, 'You need fluids because it's to keep you well.' Somebody who wouldn't understand that, you'd use the tone of your voice to be persuasive and say, 'I'd really love you to have something because it's good for you.' You'd do it in a way that I'm hoping they're hearing your tone of voice. It's persuasive rather than looking at the object, you know rather than, you know, 'You've got to drink this.' It's sort of, 'Got something that you really love,' and make them feel like it's something they could need and they can actually take in. That relationship is a very important part of, of getting people to, erm, to keep well."*

Senior staff, Group-4

Alex's gentle approach, using her voice to gently persuade was very different to Sally's more desperate approach:

> **Sally** *"They have to learn how to approach somebody, how to… whether you've got to really beg, get down on your hands and knees and beg this person which is, is going to work or sometimes, or you just have to put the glass down and say, 'Right, that's yours drink it please.' You do what will work, y'know?"*
>
> Senior staff, Group-5

In both cases, Alex and Sally conveyed how testing it can be in ensuring that some residents drink adequately.

Increasing awareness for staff was stated in all the staff groups, but it was not described in any detail about how this was undertaken. In the same way, training or 'being taught' was mentioned, but not described further, and in one home a senior staff member had been given specific responsibilities as 'hydration lead' but she did not expand on what this role entailed during the focus group, although hosting the focus group was seen as one of these strategies.

Training to increase awareness of hydration and provide information and strategies on how to help residents to drink, particularly those who are reluctant to do so, is seen as essential to prevent dehydration[125], but as with staffing levels, it is likely to be an interplay of factors which may be most effective, where training, together with committed and valued staff and supportive management structure, work together[267].

6.5.4.4.5 Providing 'hidden fluids'

Staff were aware that other foods, apart from drinks, could be good sources of fluids, especially for residents who did not drink well, or during the summer months when it was hotter and staff tried to increase residents' fluid intakes in more subtle ways. Called 'hidden fluids' involvement of the kitchen staff was essential, as Tia pointed out:

> **Tia** *"But the kitchen's good, as well, even with their meals, like there's lots of sauces."*
>
> Senior staff, Group-5

Involving all staff, not just those with direct-care responsibilities, has been described as being a key component in improving hydration care amongst residents[107].

6.5.4.4.6 Monitoring

Monitoring was talked about consistently in all the staff groups and some of the residents' groups, but it was only in the families' group where it was highlighted as being a significant source of tension. Monitoring was the predominant method of ensuring that residents were drinking enough and not becoming dehydrated. However, 'monitoring' encompassed a number of different processes and methods, depended on the resident's care needs, and was practiced in different ways in different homes and meant something different to care staff and family members. Monitoring included:

- Ensuring residents reached a certain daily target of fluid intake.
- Keeping written records of the types and timing of drinks offered and drunk.
- Making a mental note of whether drinks were offered and/or drunk.
- Observing signs of dehydration (urine output for amount and colour, observing residents' behaviour, confusion levels and any other changes).
- Communicating observations to other care home staff, residents and family members.

These points will be discussed further below.

6.5.4.4.7 Attaining a daily target and keeping written records

Attaining a daily target for fluid intake of 1500ml/day was described by staff in Group-4 and this was the same group that talked about keeping written records of drinks for all residents. However, it was not clear from the discussions about whether they were just recording drinks that were offered or how much of these were drunk as well, as the staff talked about 'recording 'drinking', as Alex described:

> **Alex** *"But we're also very aware of how much, because we keep a record of how much people are drinking."*
>
> Senior staff, Group-4

If staff were aiming for a daily target, it is likely that they were recording amounts drunk as well. It is a common misconception with 'recording fluids' that the amount offered or provided is the amount drunk, a point that was brought into the conversation in Group-5 when discussing a change in practice which involved asking staff to record what residents actually drank as well as what was offered (section 6.5.4.4.1). Their current practice was to have a tick chart on the drinks trolley to ensure that all residents were provided with a drink, and a fluid balance chart (recording drinks offered and drunk) only for new residents or those residents where there was a concern, as this conversation between Ruth and Pat described:

Ruth	*"And we have our fluid charts, as well don't we?" [talking over each other]*
DB	*"Do you use those for everybody?"*
Ruth	*"Not everybody. It's just if somebody's just …"*
Pat	*"… somebody's flagged up that they don't think they're drinking very well." […]*
Olive	*"We do it routinely with new people."*
Pat	*"Yes, when they come in."*
Ruth	*"We're trying to get a baseline, aren't we of what…." [talking over each other]*

Senior staff, Group-5

Not only were the staff talking about how and when they used fluid balance charts, but the way in which they talked about them was representative of much of the conversation around this topic in both senior staff groups when describing their care practices around drinking. Participants interrupted and talked over each other, finished each other's sentences and jumped in to add another point, showing support for each other and their keenness to describe their monitoring processes.

Frontline staff in both groups also talked about fluid balance charts for residents where there was a concern, but again, whether these were for drinks offered or drinks offered and imbibed was unclear.

Staff talked about monitoring and recording the information as a reassuring practice, reassuring themselves that they were providing appropriate care, and as 'proof' to others, but this reassurance was not experienced by families.

Families were very keen on monitoring and having written records available and spent some time during the focus group discussing this issue. This related to the significant care needs of their relatives, and the concerns that they had expressed about the difficulties of ensuring that their relatives were drinking enough, as Doris explained about her relative:

Doris *“She would never say, she can’t articulate very well and she would never be able to tell anyone, ‘I’m thirsty, can I have a drink?’ And that is a concern.”*

Family, Group-8

Three of the four family members had relatives with dementia, who forgot to drink, were unable to communicate that they would like a drink and were unable to recognise that a cup was for drinking from, so these residents needed verbal prompting and assistance to ensure that they drank. Therefore, written charts, which were accessible to families, were seen as proof that their relative had been drinking, as Frankie and Sandy described:

Frankie *“[…] to my mind, the simplest thing, rather than a computer, is just to have a day book in there, if you have somebody who has drinking issues…”*

Sandy *“They did do that at one stage…”*

Frankie *“… and you just jot down the time and how much they’ve taken, or just tick…”*

Sandy *“… and, I used to write in it, as well.”*

Family, Group-8

The families felt that they were contributing to their relative’s care by being able to complete the charts when they had helped their relative with a drink. These charts were also reassuring because families could see what their relative was drinking when they were not there. In the home where Sandy’s wife lived, computerised records had replaced written records, which families did not have access to and so Sandy felt excluded from knowing what was happening:

Sandy *“Everything is logged on to a computer here […] but it would be quite nice for me as a relative, because I can’t log on to their computers, to see a chart on the door, that just says what she’s drunk that day. I mean sometimes they’ll know and sometimes they don’t know. […] I tell them, y’know she’s just drunk 2½ glasses or 1 glass,’ and they say they’ll log that down and then sometimes you think… then they’re called somewhere else and you’re like, ‘Have they actually done it?’”*

Family, Group-8

Keeping computerised records meant that Sandy no longer knew what, when or how much his wife was drinking and Sandy was apprehensive about whether his wife was drinking enough. It seemed that the staff did not always know either, adding to his concern. Additionally, because he did not have access to the computerised records, Sandy had to tell the staff what drinks he had given his wife, but he was not sure if staff remembered to log it, and then Sandy had to ask for the information about what his wife had drunk when he was not there, although he did not like to do that, implying that he was seen as pestering when he commented that staff did not like being asked either:

Sandy *“But, that’s not accessible to me, unless I say to them, ‘Can I see what she’s…’”*

Frankie *[…]*

Sandy *“Yes, well I don’t want to be doing that all the time. They don’t want me to be doing that all the time so if they just had a simple sheet of paper, as you say….”*

Family, Group-8

None of the staff talked about using computerised records in the same way that the family members described were being used in the homes they were associated with. From the families’ perspective, computerised monitoring methods were not reassuring, because of their inaccessibility and the way that staff had to go elsewhere to record findings which they may then forget about, so the recording was incomplete. This resulted in the family members not knowing enough about their relative’s care to be reassured that they were receiving adequate care.

When the lack of records and staff knowledge were combined with other ‘evidence’ of unfinished drinks on the side and his wife appearing very thirsty when he visited, then Sandy’s concerns increased. He had already stated earlier in the discussion that when he told care staff about his wife drinking several glasses of juice, they had said that she had drunk quite a lot, leaving Sandy not quite being able to trust the mixed messages he was receiving about his wife’s drinking, and having to believe his own eyes.

Sandy was not the only relative to have reservations about whether their relative was drinking enough, as finding unfinished drinks on the side had been observed by all the participants:

Doris *"Sometimes I come in and there's a cold cup of tea."*

Sandy *"Yeah, often, yeah."*

Frankie *"Yeah, that happens, yeah."*

Gwen *"Yeah, that does happen."*

Doris *"And you know that she's not had anything to drink."*

Family, Group-8

Further on, Frankie ponders whether she may have been jumping to conclusions too quickly by assuming that unfinished drinks meant that her relative had had insufficient drinks, there may be other reasons, so she should try and trust the staff:

Frankie *"You have to try and trust the care staff, and in general you do, but then things occasionally happen, like finding that there's an empty water mug and an empty tea or a cold tea mug, and you have no idea about what exactly has happened. And it's difficult."*

Family, Group-8

Family members saw themselves as still being responsible for their relative's well-being and wanted to remain actively involved in the care of their relative, but felt that they were being excluded from the care of their relative and that their contribution to their relative's care was unacknowledged by staff. The consequence of this was that families were apprehensive about the care their relative was receiving.

The way in which the family members discussed monitoring at length, and how they mistrusted the record-keeping was illustrative of how much the family members felt excluded from care, resulting in feelings of apprehension and fractured relationships between the families and staff. Nolan and Dellesaga described how family members' caring roles change when their relative is admitted to a care home, from being the care-giver to being the care monitor, ensuring that their relative receives the appropriate care. This contrasts with staff views, who see themselves as the care-provider now and should be entrusted with this responsibility. What is lacking is communication and mutual understanding of each other's contributions, which would benefit the resident[259]. Drinks monitoring seemed to be the visible way in which families gave voice to these underlying issues, whereas for staff, discussions about monitoring provided insight into their accountability and responsibility to ensure that sufficient drinks were being offered and possibly dunk. Monitoring, using fluid balance charts are well-known for being inaccurate[268] due to difficulties in actually measuring fluid intake and output, staff not knowing whether they should record drinks offered, drunk, or both, and staff (or family members) remembering to complete them or being allowed to complete them (for example domestic staff who clear away used cups).

In the resident groups, some of the residents discussed how they monitored their own drinks intake, indicating that they remained active in their own care, as Mavis pointed out:

Mavis *"I sort of count my drinks up during the day, I drink between eight and nine drinks."*

Resident, Group-2

Staff advising residents to drink more, particularly if they did not seem to be drinking enough, was discussed in all the groups, but nothing was mentioned about involving residents in their own monitoring.

6.5.4.4.8 Observing signs of dehydration

In addition to monitoring fluid intake, staff and families also talked about monitoring signs of dehydration, mentioning a number of common signs and poor health outcomes associated with dehydration, as the staff in Group-4 listed:

Suki *"Urine infections, falls, skin…."*

Una *"Dehydration."*

Suki *"Skin, skin breaking down."*

Tia *"Low blood pressure."*

Una *"Dizziness, delirium."*

Senior staff, Group-4

In the families' group, Frankie also described one of the signs commonly associated with dehydration to inform the other participants, and how they could expect staff to know these if they had received some training:

Frankie *"And actually you can train carers to look at somebody's tongue. If you've a shiny tongue, you're not dehydrated."*

Family, Group-8

Other signs which were mentioned by participants included urine odour and amount of urine output, headaches, confusion, lethargy, dry skin and tongue. Several care staff talked about not relying on just one sign, but by 'knowing' their residents and building a picture, then this may indicate whether they were becoming dehydrated, as Alex explained:

Alex *"We also look at the whole person, […] their walking, […] their weight […] they might be more confused. […], not just 'Are they drinking enough?'"*

Senior staff, Group-4

I was interested in which signs were mentioned because of my involvement in the DRIE study and my work investigating the validity of these signs to detect dehydration in older people. I was careful not to say anything about this work during the focus groups, although participants were aware that I was researching into other aspects of hydration care.

6.5.4.4.9 Communicating observation findings to other staff

If monitoring is to be effective in identifying residents who do not drink enough or who are becoming dehydrated, then the results need to be communicated effectively. In the staff and families' groups, written and verbal communication were discussed, and in the families' group they talked about the additional use of computer records, which had recently been introduced in one of the care homes which they were associated with.

Communication amongst staff included handover meetings between different shifts, documentation (including fluid-balance charts) as well as constant ongoing verbal communication between staff during a shift, as Pat pointed out:

Pat *"Because it changes so frequently, we can make notes about it, we've got their likes and dislikes, which we can change, but mostly it's just by… we'll verbalise it, y'know? […] There's a constant handover of information, not just in the staff room before the shift starts but a constant handover of information, sort of, 'Who hasn't drunk anything?' Well, right 'yesterday, this and this and this worked,' so it's a constant handover of information."*

Senior staff, Group-5

Pat mentioned the way in which residents' preferences could change frequently, and so written records may not be the best way of keeping up to date with these, although for staff in Group-4, documentation was seen to be the key.

Documentation was not only a method of communication between staff, it was also seen as evidence of practice. It was not stated as explicitly as this, but it was frequently mentioned in a way that implied this, as the following quote by Suki showed when asked about how she managed residents who did not want to drink:

Suki *"Little and often. Whatever you can – and record it!"*

Senior staff, Group-4

Suki's last words: 'and record it' were echoed by some of the other participants, which seemed to indicate how strongly they agreed with Suki. It was not just in senior staff groups that staff made sure they documented their observations, frontline staff were mindful of this too, as Cat said:

Cat *"We know that if we've checked pads or we've checked glasses and nothing's been taken down, we always report it and it's always monitored, you know?"*

Carer, Group-6

However, communication was not always as effective as staff liked to think, as pointed out by Cat:

Cat *"We know what they've consumed and toilet-wise when we've done the shift, but we don't know when we've gone home what's happened."*

Bea *"Yes, 'cos we're not looking after them 24/7, are we?"*

Carers, Group-6

Methods of communicating seemed to vary between homes, with staff in Group-4 indicating that they relied heavily on written communication, and the participants from Group-5 seeming to rely more on verbal communications. Sidenvall and Ek in their qualitative study of mealtimes in Swedish care homes, observed that verbal communication predominated, but how this impacted on residents' care was not reported[269].

The way in which staff provided care to address residents' needs is described below. Whilst care home policies and systems guided this care, staff also described 'knowing' residents and how they drew on their own experiences. Staff also described how their care could be compromised by conflicting priorities and the difficulties of residents refusing to drink.

6.5.4.5 Staff meeting needs

For staff, knowing resident's drink preferences and being able to provide them was considered to be part of their caring role and intrinsic to delivering person-centred care, a concept talked about in all the staff groups[5]. The provision of person-centred care was described as policy, but the practicalities of how this was undertaken seemed to be more intuitive, especially when residents had communication difficulties. With these residents, staff described how they learnt to understand the alternative ways in which residents communicated which was only possible because they knew their residents well. 'Knowing' residents was identified many times as being a key factor in being able to provide appropriate care and staff were proud of the way they developed these intuitive skills, as Pat described:

> **Pat** *"So much of it is by touch, time, observation and you just pick up on body language, on the way somebody's singing […] we don't realise how good we are at it until you try to explain it to somebody […] as we did today with the doctor […] but you know your residents, you know their body language, so many things that you add up to get to an answer and we do it all the time, don't we? Absolutely all the time."*
>
> Senior staff, Group-5

---

[5] Person-centred care is an approach to meeting residents' care needs and preferences that are cost-effective and appropriate (IOPA, 2007).

Family members, too, recognised how important it was for carers to know their residents, as Sandy described previously when he was concerned about agency staff not knowing his wife (section 6.5.4.4.2).

For staff to be able to meet resident's needs, they need to know what those needs are, they need to have strategies of finding out about those needs and they need to understand whether these can be met within the care home's policies, all of which requires skilful and complex decision-making[128]. Delivering person-centred care also requires the resident to have choice and for this choice to be recognised. Central to this was the matter of 'knowing' residents. For nurses and carers who 'know' their patients and residents, this requires that they have developed a positive relationship over time and have used their experience and knowledge of the patient or resident to engage in safe and expert practice which benefits the patient or resident[270]. 'Knowing' the resident is very personal, specific and situational, as the staff and families in this study described, with both staff and family members valuing it as a way of being able to provide personalised care.

6.5.4.5.1 Verbal encouragement

Like staff, family members were aware that drinking was a part of care, as Doris stated just as the focus group was about to finish and I asked what was the one thing that they would wish for to help their resident to drink more:

Doris *"I think it just comes down to care."*

All *"Prompting, prompting, prompting!"*

Family, Group-8

Staff agreed that reminders and prompting were an ongoing part of their role:

Aya *"But that's like for us to keep, to keep mentioning it, of course."*

Carer, Group-6

Verbal encouragement such as advice, prompting, cueing, encouragement and humour was mentioned frequently by all participants, with staff describing how they tailored their approach to individual residents' needs and levels of understanding. Staff acknowledged that repeated requests to drink could be annoying for some residents, but not all. For residents who were able to understand explanations of why drinking is important, staff used this approach and in this study, residents described how they had appreciated the advice provided by staff, with no suggestion at all that advice was excessive or annoying (section 6.5.4.2).

Tailoring verbal encouragement to individual residents' needs and understanding is recognised as being central to person-centredness as well as ethical[249].

6.5.4.5.2 Empathy and pre-empting needs

Staff described ways that they used to try and help residents to drink, drawing on their own experiences and empathising with residents to try and provide personalised care, as Bea explained:

> **Bea** *"And sometimes after a bath, because that dries me out, […] I'll offer, 'Would you like a nice cup of tea?' […] I'm thirsty after a bath, you know."*
>
> Carer, Group-6

Bea, and her colleague Cat, had already described how their own experiences of dehydration had influenced their approach to care because they knew what it felt like first-hand, and how unwell they felt (section 6.5.3.6.4). Olive and Pat described a similar approach in Group-5, illustrating the way in which staff used their own experiences to empathise and pre-empt residents' needs:

> **Olive** *"You have to pre-empt them all the time…."*
>
> **Pat** *"… one step ahead. I'm thirsty, they'll be thirsty."*
>
> Senior staff, Group-5

The way in which staff met needs and were proactive with assistance did not go unnoticed by the residents who described examples of when this occurred, as Mavis remarked:

> **Mavis** *"For when I go up to [name of town], they give me a bottle of water, or squash and that to take with me."*
>
> Resident, Group-2

Betty also described the way in which care staff were pro-active in providing advice and increasing awareness about drinking:

Betty *"Aya [carer] she drinks heck of a lot of water and she will give you little talks about why you should drink water, you know?"*

Resident, Group-1

Betty had also observed that not only did Aya provide lots of advice, but she drank a lot of water herself. And although Betty does not comment about whether this influenced her own drinking, it is interesting that she had noticed and commented on it. Role modelling in this way (by Aya) may well have a positive effect on the residents[271].

6.5.4.5.3 Conflicting priorities

Ensuring that residents drink well could sometimes conflict with other care needs, creating tensions which meant that the job of caring was frustrating at times:

Aya *"Some part of it is the job is frustrating, but you don't get angry."*

Carer, Group-6

A number of staff and families made comments about balancing residents' preferences with safety issues, and the dilemmas this could cause.

For staff and families, residents in their care who spilt drinks were a problem because of concerns about scalding. Further, residents who fell asleep holding drinks could not only spill them, but they were not getting their drink either, as Aya highlighted:

Aya *"… just fall asleep, fall asleep on their drinks and […] burn themselves."*

Carer, Group-6

Frankie, in the families' group, also mentioned this concern when commenting on one of the drinking aids I had taken in (Drinking Vessel 5, Figure 6-1):

Frankie *"I think my dad would prefer to drink from that but then he might fall asleep and it would spill."*

Family, Group-8

In another focus group, Gail empathised with residents about not receiving the drinks they preferred, knowing that many residents liked their tea hot (as she did by choice) but as a carer she could not serve hot tea, she had to serve tea cooler, because residents with dementia needed to have the cup placed in their hands in order to drink independently.

> **Gail** *"I sometimes find myself putting myself in their place, […] I can drink cold tea, I've spent a lot of my working life sort of making a cup of tea for myself and then realising it's got cold and I can drink it that way […] I wouldn't do it through choice."*
>
> Carer, Group-7

This dilemma did not go unnoticed by Frankie in the families' group, who sympathised, but at the same time was frustrated by it, knowing that her mother disliked cold tea:

> **Frankie** *"My mother would not drink the tea because it was too cold, and of course the staff don't want to serve it very hot because they might scald themselves."*
>
> Family, Group-8

Residents scalding themselves with hot drinks is a risk, and has to be balanced against a resident not drinking (section 6.5.4.5.4), but none of the staff talked about alternative ways of how they might overcome these kind of dilemmas. Popham and Orrell in their study investigating what matters for people with dementia in care homes suggested that in the case of such conflicts (i.e. balancing risk versus residents preferences) then carers tended to act in favour of a protective and custodial role for the care home[272], as described by the carers in this study regarding drinking.

Spilling drinks was never mentioned by residents themselves, except when they talked about the cups which accompanied the water coolers (section 6.5.3.7.4). Whether residents felt any sense of embarrassment about spilling any other kinds of drinks or drinking in a way that would cause embarrassment to themselves or others, was not discussed by any of the participants, although Sandy may have been alluding to it when he talked about his wife who did not like being with other residents in the care home:

> **Sandy** *"She doesn't like being with these other people because she could see, maybe, that they're not quite normal, but she doesn't know that she's got dementia."*
>
> Family, Group-8

Offering choice could be another contentious issue. In Group-7, offering choice as a means of delivering person-centred care was highlighted as challenging because, by offering choice, residents had the opportunity of saying 'no' which had to be respected, even though this may not be in the residents' best interest. If staff lacked time to offer drinks at a later time, then the result was that the resident had missed out on a drink, as explained by Gail:

Gail *"I mean it's [i.e. person-centred-care] supposed to be all about choice and making a choice, but if you asked every single one of the residents sometimes, 'Do you want…?', 'Would you like a drink?' they would probably say, 'No,' and you can't, you can't sort of go that route, really."*

Carer, Group-7

Gail highlighted the time-consuming element of offering choice. As with prioritising different tasks, staff also had to prioritise how to deliver individual tasks if they were time-limited, so that offering a choice of drinks, a choice of how they are made (caffeinated or decaffeinated, with or without milk or sugar etc.) and a choice of how they are served (cup/mug etc.) are all time-consuming.

The extra time required by residents who needed a carer to sit with them when having a drink, either because they had swallowing problems or because they were unlikely to drink otherwise could also impact on staff time, as described by Avril:

Avril *"We have to make sure there's enough staff on, as well, because we're finding it can take up to 20 minutes, maybe longer, to assist somebody who can't drink."*

Senior staff, Group-4

Care staff were aware that ensuring residents drank well was a key element of their role, but sometimes this was just one priority amongst many care needs, and occasionally these care needs could be at odds with one another, especially if it related to unplanned-for happenings implying that there was little slack in the system to allow for untoward events, as Avril explained:

Avril *"You may get a really unsettled shift where all the residents were unsettled and anxious and agitated and the poor staff are trying to do their job and the tasks have to be performed as well as the person-centredness."*

Senior staff, Group-4

Other challenges relating to drinking which were voiced by the staff were anxieties about difficulties swallowing and choking and residents who wandered.

Anxieties about swallowing and choking related to the carer with the responsibility of providing the assistance and carer's worrying on residents' behalf, as Sara and Gail explained:

Sara *"She worry because she choke all the time. Any time give her a drink she'd have to say, 'I might choke.'"*

Gail *"Can be sort of alarming for them and for us, in fact, to get fluids in."*

Carers, Group-7

Sara and Gail highlighted that part of their role was overcoming any anxieties associated with the fear of drinking.

Carers were also concerned about residents who were prone to wandering around the home, not sitting still long enough to consume a whole drink, but some residents would also drink from any cup or glass that was available, so risking infection. In these instances, staff described how they found it difficult to ensure that these residents were drinking enough because monitoring their intake was problematic:

Ruth *"If people are up in the lounge and they've had a cup of tea and some of them might just leave it and wander in, and whose was that? You know what I mean? That is how it becomes difficult."*

Senior staff, Group-5

Another area of tension for staff seemed to be the very fact that they were mentioning these dilemmas at all, especially when they seemed to indicate that the tensions were related to care home issues, because by doing so may have seemed disloyal to their colleagues.

These quotes illustrated the problems of implementing person-centred care when there were constraints of time and staff availability or other care needs. In practice, this can be frustrating because residents may want or refuse something that would not be in their interest, and it may also conflict with the institution's requirements[267]. This means that staff may have dilemmas about the care they provide, leaving them frustrated and feeling that they are not fully achieving what is being expected of them, whether that is their own expectations of themselves, those of their colleagues and managers or external scrutinisers. Person-centred care is an holistic approach to care, where care is customised according to the resident's individual needs, preferences and abilities[273,274], but it can be difficult to deliver unless there is organisational support[275], in the way that has been described here.

6.5.4.5.4 Residents who refuse to drink

Staff described how some residents refused or were reluctant to drink. The reasons for this were not always made clear, although for residents without dementia, lack of awareness was highlighted as a possible reason, together with anxieties about micturition, spilling drinks or requiring help with either drinks or toileting assistance. For people with dementia, simply refusing was described by staff as common and challenging.

Residents who refuse to drink provide a specific instance of where there is a direct conflict between the residents' autonomy to choose, and of it not being in their best interests, causing dilemmas for the care staff, and requiring staff to work together, using their knowledge and experience to ensure that these residents did drink, as the staff in Group-4 explained:

DB *"Are there times when residents just don't want to drink?"*

Several *"Yes."*

Suki *"We have residents are, very…."*

Avril *"…. they'll clamp their teeth together"*

Suki *"Yes, and that is the biggest challenge."*

DB *"How do you overcome that?"*

Una *"Just perseverance."*

Suki *"Persevere."*

Una *"Trying different ways" […]*

Suki *"Small and often"*

Una *"Different faces…."*

Senior staff, Group-4

Several of the staff joined in this discussion, sharing their thoughts about how they overcame the problem of residents refusing to drink. In particular the idea of perseverance, of continuing to try using different approaches, including 'different faces' which required working together and acknowledging that interpersonal relationships between staff members and individual residents existed and could be used for the resident's benefit. The positive effect on drinking, of different approaches and carers, was also highlighted by Sandy in the families' group:

Sandy *"But I feel that I'm there with my voice that she's known for 37 years, 'Would you like a drink, dear?'"*

Family, Group-8

Sandy described the way in which his wife recognised his familiar voice and was probably reassured by it and so accepted a drink from him after she had refused drinks from the staff.

Staff in one focus group talked about force and how it was impermissible but at the same time there was the challenge of how to ensure residents drank, with staff describing how they did the best they could by using different ways of encouragement:

Pat *"You just cannot force somebody to drink if they do not wish to. You cannot. You can encourage and there are so many ways that we encourage, with food and everything, but you cannot force them to drink and nor is it right to do so. We do the best that we can in the kindest way we possibly can. If it was me I would say, 'Oh, for God's sake, if that woman comes and asks me if I want another cup of tea, I'm going to ram that cup of tea down her throat!' [laugh] but we still do it!" [laughter]*

Senior staff, Group-5

At the same time as acknowledging how annoying it could be for the resident, and how easy it was to cross the line from encouragement and prompting into nagging, Pat continued by stating that there were many ways of encouraging reluctant residents to drink, and she went on to describe a more gentle approach:

Pat *"'Oh, the tea trolley will be here in a minute.' […] That's encouraged them to think about having a drink. Hopefully, they will sit down and have a drink."*

Senior staff, Group-5

Staff in another focus group expressed concerns about the possibility of some family members using 'force' to ensure that their relative drank, not quite trusting that perhaps relatives had succeeded where they, as carers, may have failed. This viewpoint has been recognised in other care home situations and described by Ryan and Scullion who suggested that staff tended to be more mistrustful of families providing care when that care involved risk[264], creating tension between staff and family carers. Nolan and

Dellesaga proposed that if staff and families both acknowledged and valued the contributions each makes to the care of the resident, then relationships between these two groups would improve[259].

In one staff group, the contentious issue of persuasion was brought into the conversation, when a carer described how a resident did not seem to understand that a drink was being offered, so the resident would wave her arms around (the carer demonstrated this as she talked) trying to resist the offer until the resident tasted the drink, when she would then continue to drink it:

> *"We've got one lady who would push you away, […] because she doesn't recognise that you're offering her a drink. If you can get the drink to her she will drink, but it's getting that drink there!"*
>
> Carer, Group-7

The carer was relying on her past experience of helping this lady to ensure that her actions were appropriate and she was not applying undue persuasion.

These quotes illustrate that not all residents were appreciative of staff's attempts to help them with drinking, and so staff had to develop different approaches and stay firm, as Bea did when she described how she tried to get a reluctant lady to drink:

> **Bea** *"We had one little lady, she was the most loveliest, placidest little lady, but as soon as I said, you know, do you mind drinking, she used to fly off the handle, say, 'You always getting on at me about water,' which we weren't, 'cos I was saying ever so nice, but she felt everybody was… and I said, 'No, we're asking everyone, especially in the hot weather'."*
>
> Carer, Group-6

When Bea was describing what she said to this lady, her voice changed, and she spoke slowly and with authority to reinforce what she actually said. Bea was not the only member of staff who reported that their prompting was disliked, as the staff in Group-7 also found.

> **Gail** *"There's just certain individuals, just take a sip, put it down, leave it and then […] you're picking it up, giving it to them again and trying again."*
>
> **Sara** *"You can tell they get annoyed with that, isn't it?"*
>
> Carers, Group-7

Residents refusing to drink was difficult for the staff, and posed ethical dilemmas, which some observers have suggested that care staff may not always be well-prepared to deal with[128,249].

6.5.4.5.5 Deception

Deception is when an attempt is made to mislead someone, to make a person believe something that we do not believe ourselves[276] and its use is prevalent in dementia care[277]. In this study staff and families both described occasions when deception was used to encourage residents to drink. This seemed to be one of the strategies used in response to the challenges they encountered in ensuring residents in their care drank enough.

Deception was mentioned in three of the four staff groups, and has already been described in relation to alcohol (section 6.5.3.6.2) and treats (section 6.5.3.6.1), but for the staff in Group-6, they had a different concern, balancing their concerns about the salt content of a whole Oxo cube to make a resident’s drink and the need for him to drink, so they tried making the drink with half a cube:

Cat *“We’ve got one with an Oxo, haven’t we?” [talking over each other]*

[…]

Bea *“… which is not good, really, because it’s the salt, isn’t it?”*

Aya *“Yes.”*

Cat *“Well, they just… what… we watch, we watch his ….” [talking over each other]*

Bea *“We have to, yeah and I’ll go put just a half of Oxo in, won’t you, but he’s …” [talking over each other]*

[…]

Bea *“…. he got so he ….knew!”*

Cat *“…….you know what I mean!”*

Bea *[banging the table] “He says, ‘I want a whole one in there.’” [laughter]*

Carers, Group-6

The three members of staff colluded with each other as they relayed the story animatedly and with humour, finishing each other’s sentences and talking over each other, especially when they revealed that the resident knew what had happened and demanded that they used a whole Oxo cube.

Family members also participated in minor deception, as Sandy described when he could not bring himself to tell his wife that he was leaving her to go home:

> **Sandy** *"I pretend I live here, I say, 'I'm just going outside to cut the grass,' or: 'I have been playing with Rascal [the dog].' I never say I'm going home."*
>
> Family, Group-8

Whether using deception to justify beneficence is acceptable is a complex ethical dilemma when caring for people with dementia who are experiencing difficulties relating to reality[276]. Schermer argues that deception increases a person's distance from reality, increasing their confusion about the world around them. For the person being deceived, it impinges on their dignity and autonomy as well as undermining trust between the deceiver and the deceived. For the deceiver, their integrity and credibility is damaged[276]. Schermer acknowledges that there are occasions when deception is justifiable when the truth would 'force' a person into a reality which is full of pain which they are no longer able to deal with, but in general she argues that investigating other methods to enhance a person's well-being should be the aim of care, which demands insight[276]. Schermer's theoretical arguments were largely supported by the findings of Day et al's qualitative study investigating the acceptability of lying and deception from the viewpoint of people with dementia[278].

6.5.4.6 Fostering sense of well-being amongst staff, residents and families

In many of the focus groups there was a sense of loyalty by the participants for the care home with which they were associated, and this was often revealed when making comparisons with other care homes. A typical comment was made by Avril when talking about one of their regular events:

> **Avril** *"We always have Pimms, don't we, on a summer afternoon. I'm quite proud of that. Don't think many care homes do that!" [chuckles].*
>
> Senior staff, Group-4

Avril was proud of her care home and the innovations they had introduced, and she described several of these during the focus group.

In Group-5, staff demonstrated support for their care home when I asked about training:

Sally *"I think you can always do with more training, but again, it's on the ball here."*

Senior staff, Group-5

Fostering a supportive environment seemed to be one of the ways in which managers could help staff deal with the challenges encountered in the workplace. But staff also mentioned instances about their work which were positive experiences, such as expressing fondness for particular residents, or a sense of achievement when their help had been successful or was appreciated, as described by Cat:

Cat *"Before he came in here, he didn't drink hardly at all. He had a cup of tea and he didn't even drink that. But now, we are actually getting him to drink water, as well as juice."*

Carer, Group-6

Focussing on instances of good care in this way has been described as a way of compensating for the frustrations about being unable to always provide good care[267] with Wilson et al suggesting that fostering positive relationships between staff and between staff, residents and families enhances job satisfaction[279].

Families, too, despite voicing many reservations, also expressed loyalty to the home where their relative was now living, as Gwen commented:

Gwen *"It's like a hotel, really, when you walk in, it's really lovely."*

Family, Group-8

The way in which this sense of loyalty to the care home was displayed may be part of a reluctance to appear critical in front of others as well as a reflection of the dependency relationships which residents have on staff, and staff have on each other and on their senior staff, so that any criticisms may impact on their care (for residents) or employment (for carers). Families, although discussing their dependency on care staff to provide their relative with good care, were less dependent, and so this may account for the way in which they spoke more freely about negative aspects of care, in the same way that care staff were more critical of them.

6.5.4.7 Care staff's frustration with external criticisms about poor care

In all the staff groups, staff felt frustrated about the lack of understanding that families, the general public and the media had about dementia and its effects on people, and therefore how challenging their work is, as Pat graphically described:

Pat *"And people's expectations of what people are like in these places – they have dementia, they have got dementia. It's not a hospital, but they're poorly. They're not going to do things that you would expect them to do. They're going to crawl on the floor, they're going to do odd things – that's what's wrong with them. That's why they're here, to be cared for."*

Senior staff, Group-5

Pat and Sally provided a number of graphic and explicit descriptions of their work throughout the focus group.

Whilst staff indicated that some family members did not realise the impact of dementia on their relatives and the challenges this created for carers, the families in Group-8 were fully aware, describing some of the more extreme behaviours, such as Sandy's description of an incident involving his wife:

Sandy *"She's given them black eyes, they've got cuts and really gone for them."*

Family, Group-8

Faced with these kinds of challenges, where staff's own safety is compromised, staff felt vulnerable, and yet they were still expected to provide consistent care. Thus, they found it upsetting when media attention focussed on poor care in some care homes, ignoring the many good care homes and carers who were providing good care in difficult circumstances, as Una passionately stated:

Una *"Yeah, where's the positive programmes about care homes, because you know, for all the awful one carer, there's ten amazing carers out there and, you know, where's the, where's the support and the, you know, showing how good we are?" [Claps her hands together]*

Avril *"[…] and actually families were coming saying, 'Did you see that programme? I'm so pleased mum's here.'"*

Senior staff, Group-4

Following on from this, Una's manager was keen to reassure Una and the other staff who had expressed similar sentiments, that she had received some very positive comments from families about their particular care home. In Group-5, Olive took a similar approach to reassure the staff following a comparable discussion in their group:

DB *“Do you think that the wider world understands all that you do and appreciate what you do?”*

All *“No!”*

Ruth *“Haven’t got a clue”*

Sally *“No, no idea. (3 sec pause) Well that quietened us!”*

Olive *“As she left, she [the daughter] said: ‘Every time I come, I find a little bit more about what you do’ she said ‘and I’m just amazed at the things you do.’”*

Senior staff, Group-5

I think the way in which the participants answered ‘no’ all together in response to my question, with a subsequent pause, were both significant in portraying the depth of feeling about the staff’s views on this. In both groups, the way in which the more senior staff stepped in to support their staff and provide reassurance was evidence of what they had all talked about earlier, in that they supported each other and their frontline staff.

It was not just the media whose comments were found to be upsetting, comments from hospital staff were also felt to be unfair, particularly as care staff had a poor opinion of the care the hospitals were supposed to provide, reporting failures in hospital care, and thus reluctant for residents to be admitted to hospital if it could be avoided. The following discussion in Group-5 echoed thoughts expressed in all the staff and families groups, about how these participants felt about hospital admissions:

Olive *“We want them home asap.”*

Pat *“Sometimes they come back and you think… ‘Oh!’”*

Sally *“You know, agh! Bed sores, dehydration……”*

Olive *“You know that the people here don’t cope well with the change. It’s incredibly traumatic for them, so although they might have to go sometimes, it’s not likely to be a very positive experience for anybody.”*

Sally *“But we’re keen to get them back and, to be perfectly honest, the hospital are keen for them to be back, as well.”*

Pat *“Because they are time-consuming, y’know, just – whatever their health issues, they are time-consuming as they probably need their continence aids changed, they need feeding, everything needs to be* *done and that's, it's very time-consuming, so we want to get them back to us ….. as soon as possible."*

[…]

Olive *"But families have requested not…"*

Pat *"….please unless it is the absolutely last….."*

Senior staff, Group-5

The staff in this group went on to say that they worked with families and their local GPs to avoid hospital admissions where possible. In addition to the poor care they saw their residents receiving in hospital, staff also recognised the disorientating effect hospital has on someone with dementia, so adding to their distress.

Care staff felt that when their residents were admitted to hospital, it was almost assumed by the hospital that the resident would be dehydrated, as Aya explained:

Aya *"But how much we give our residents, it's still not enough when they go in hospital and they say they're dehydrated, you think, 'Oh, no! They've had quite a bit to drink today."*

Carer, Group-6

Residents did not talk about hospital admissions in this way. If they had experienced an admission, it was described matter-of-factly.

The findings from this qualitative study were wide-ranging, reflected by one participant's comment after the focus group concluded:

"I never knew there was so much to say about drinking!"

Carer, Group-6

Whilst reporting the individual findings, I have conceptualised them with pertinent research findings. In the next section, the discussion, I will bring the findings together to discuss how they might impact on hydration care for older care home residents.

6.6 Discussion

The aim of this study was to explore the views and experiences of residents, families and staff to understand issues which may help and/or hinder residents to drink well, from the experiential perspective of those directly involved. The research question which this study addressed was:

> *Amongst residents, their families and care staff, what experiences, views and perceptions influence their approach to supporting residents to drink well to prevent dehydration?*

In addressing this question I used a qualitative interpretivist approach, involving residents, families and carers to discuss their views around drinking and hydration care in older people living in care homes. Using purposive sampling I recruited 29 residents, family members, frontline and senior staff to participate in eight separate focus groups. The conversations were recorded, transcribed verbatim and analysed thematically. Three themes emerged from the data: ‘the meaning and experiences of drinking’, ‘caring roles to support residents to drink’ and ‘the tensions and barriers to successful drinking’ inherent in both these themes (Figure 6-3). There were twenty sub-themes and these evolved from the categories and coding of the data (Table 6-3).

The following discussion will discuss the findings from this study and how they have addressed the research question. I will then compare these findings with those from other research studies in this area, the strengths and limitations of this study, and conclusions.

6.6.1 Summary of findings

‘The meaning and experiences of drinking’ was an overarching theme where participants talked about what drinking meant to them and to those they were caring for, and this encompassed the second theme of ‘caring roles’ where participants described their own roles and those of others relating to the support residents needed to drink well. Inherent in both themes was the third theme ‘tensions and barriers to successful drinking’ which described the challenges associated with drinking and hydration care. These three themes were found across the four participant group types (residents, families, senior and frontline staff), but were manifested in different ways and the detailed findings were presented within the sub-themes alongside existing research in the particular area to provide context and a fuller interpretation.

In this discussion, I will summarise the main themes as they relate to each participant group before relating the findings of this study to other similar studies.

6.6.1.1 Residents

Residents discussed why they may drink and the kinds of circumstances that some drinks were most suited to. This included ‘treat’ drinks, water with medications, and the pleasure of a cup of tea first thing in the morning. There seemed to be a general dislike of water served in jugs which was left to become lukewarm and ‘lifeless’. Residents listened to advice about what and when to drink, and which drinks to avoid due to health reasons, and so they changed their preferences accordingly. Residents were actively involved in their own care, monitoring their intake and choosing drinks which were healthier. Residents had mixed views about whether to drink or avoid drinks in the evening or at other times of the day because of anxieties relating to needing the toilet.

Residents reminisced about social experiences of drinking with family and at work as hospitality and reciprocity, whereas families and staff talked about the social facilitation and social modelling aspects of drinking. Living in care homes, some residents did not mention if they were able to continue offering drinks to visitors, whereas other residents described how they were able to continue offering, but they expected their visitors to make the drinks themselves. Residents described a number of ways in which they had adapted to manage their preferences and remain as independent as possible. Such as altering their preferences for drinks and how and when they were served, managing their current situation by waiting for staff to notice difficulties, fitting in with care home routines and preferring to do this rather than disturbing the staff unnecessarily or appearing critical of their help. There was one area where residents seemed unable to fully adapt and this related to the difficulties associated with holding certain cups and glasses. Residents did not talk about using drinking aids.

Thus, residents were reliant on the care home routines and observant staff to recognise when help was needed.

6.6.1.2 Staff

All staff recognised their role in supporting residents to drink. Staff, particularly senior staff, discussed how their care was informed and guided by care home policies, and all staff talked about ‘knowing’ residents, tailoring their care to meet individual residents’ needs and preferences. Sometimes the ability to provide personal care conflicted with organisational issues, and one example provided was how time-consuming it can be to offer a choice of drinks and how to serve them.

Staff also talked about the challenges of care and on doing so, they seemed to draw on their own experiences to inform practice, often empathising with residents and trying to put themselves in their place to deliver care that would be appropriate. Some residents were challenging to look after, refusing drinks, drinking small amounts, or even throwing and spilling drinks. Staff described some of the different approaches they used with these residents and there was a sense of achievement when they described how they had successfully dealt with a challenging situation. Staff expressed pride in the way they learnt to communicate with, and understand residents who had communication difficulties to make sure that residents received the drinks that they wanted in the way that they wanted them.

Staff also described how they had to balance meeting residents' preferences with any risks associated with that choice, such as whether a favoured drink was too salty and 'bad for their blood pressure' or whether alcohol was permitted. Such decisions sometimes led to minor deceptions, for example the use of low-alcohol wines. There was little discussion about the kind of training staff may have received in hydration care, with staff often describing how they drew on their own experiences to deal with issues, although all staff mentioned the supportiveness of colleagues at all levels.

Senior staff seemed to be particularly aware of how their care was perceived by external agencies and were upset by any negative reporting by the media, or criticisms by other health professionals who did not know them or the challenges they were faced with in providing care. Conversely, staff were very appreciative of positive health professional support.

Staff, like residents, reported that some of the cups and glasses used by residents were too heavy and difficult to hold, although they did not describe how this was dealt with. Like families, most staff saw drinking aids as a positive, practical solution to enable a resident to drink independently, although not all staff held this view, with one staff member associating it with stigma for the home. There was little discussion about the decision-making process around the use of drinking aids, deciding who needed them, how an aid was selected and what the resident thought about it.

Staff were aware that residents could be embarrassed by and worried about the effects of drinking and the subsequent need for the toilet, and described how they approached this issue sensitively by trying to reassure residents.

Regarding families, staff saw families as needing support, recognising the distress they were probably feeling. Staff seemed limited in the support that they could provide and they also felt that families' expectations of them could be unrealistic at times. Staff were aware that families wished to be involved in care to differing degrees, with some families willing to physically assist with drinking and others would not. Involving families to assist with drinking was a further dilemma for some staff, as they felt that families were ill-equipped to deal with some of the complexities of care which was a concern as staff felt that they were ultimately responsible and accountable for residents' care. However, no-one discussed providing any kind of guidance to address this. Whilst the staff and family groups in this study were completely unrelated (they were set in different care homes), participants seemed to be describing the same problems about the same issues, and there was a lack of understanding of each other's roles, leading to a degree of wariness and possibly mistrust of each other.

6.6.1.3 Families

Families shared their experiences and concerns of caring for relatives who needed support to drink well. Families described how their caring roles in providing support for their relatives to drink were not fully acknowledged by staff. The family members in Group-8 were actively involved in their relatives' care, physically assisting with drinking when visiting, and therefore expected that their contribution would be acknowledged by staff, but instead they felt that their help and their wish to be included in care in this way was sometimes seen as interfering, creating tensions between staff and family members. Families became concerned if their relatives were given drinks they had always disliked, assuming that this was due to poor care rather than because their relative may have changed their preferences (a point which staff mentioned several times), but if this was the case, any changes in preferences were not being communicated to the families. Families reported being kept informed about what was happening to their relative regarding appointments and more general updates, and families appreciated the care their relative was receiving in the home, acknowledging that, as families, they were unable to provide the same level of care themselves. Families were also aware that staff could not provide constant one-to-one care when they had other residents' needs to consider. Even so, families were concerned if they came in and found drinks out of reach, not recorded on the charts and their relative thirsty, with families deliberating whether it was in their relatives' interests to discuss these observations with staff. Another dilemma for families was ensuring that their relative drank well whilst retaining their dignity; there were differing views about their relative using drinking aids, some family members were pragmatic, seeing aids as enabling, whilst others saw them as impinging on their relative's dignity.

Family members were more prepared to express any misgivings about quality of care than either the residents themselves or the staff.

6.6.1.4 Novel findings

This study produced several new findings not previously reported in the literature around hydration care for older people living in care homes. These include the way in which the meaning an experiences of drinking impacts on caring roles, the tensions and barriers experienced by all participants, and the impact these have on drinking and caring. I have attributed caring roles to residents, as well as families and staff, as residents were proactive in their own hydration care, in a way not previously recognised. Other novel findings include the way in which residents reminisced about hospitality and its association with drinking, and the way in which participants perceived that drinking habits had changed and the way in which residents adapted and changed their preferences in a number of ways, rather than ask for help. Tensions between families and staff regarding shared caring roles for drinking were described, and for staff, knowing residents' preferences, and drawing on their own experiences to support residents to drink, have not been described previously in relation to hydration care. Novel findings around barriers and tensions impacting on residents drinking experiences and care needs included identification that providing choice is time-consuming; dilemmas for staff occur when individual resident needs and those of the wider community diverge; the way staff used deception to substitute a resident's favoured drink which staff considered unsuitable, with one which staff considered more appropriate; and external criticisms of care, which staff found upsetting.

Thus supporting residents to drink well is a complex interaction of factors and caring roles. Caring roles are assigned to staff, but are assumed by residents and families and as such, are under-acknowledged. Acknowledging and valuing residents' and families' contributions may support staff in their designated roles of providing hydration care, and this, in turn, could be an important contribution to preventing dehydration in older care home residents.

6.6.2 Relating this qualitative study to other similar studies

Older people living in care homes have specific care needs for drinking and hydration care. Hydration care is itself distinct from the wider remit of nutritional care, both physiologically and socially. Physiologically, water or fluids are a dietary component which are essential for life and deficiencies are apparent within hours and secondly, the social context of drinking is also different to eating, with drinking often taking place independently of eating and more informally, and therefore should be considered separately. A number of studies have investigated nutritional care which has encompassed hydration care, but few qualitative studies have focused on and explored hydration care for older people living in care homes specifically and those that have, have addressed different research questions and used different methods to explore hydration care in care homes. Further, care homes themselves differ enormously, not only between countries, but within countries, with regards to many factors including funding, size, ownership, type of care offered and organisational cultures. Thus, direct comparisons between studies are not possible, but similarities and differences in findings will be discussed in relation to the study reported here.

In 2012, in the UK, Godfrey et al's exploratory study investigated the complexity of issues associated with hydration care in older people residing in an acute hospital and a nursing home using mixed data collection methods (observations, staff focus groups, resident/patient one-to-one interviews and written comments from family members)[120]. The six themes they reported on (availability, pleasure, importance, help and assistance required, barriers and diminished experience of drinking) were replicated in the current study confirming the ubiquitous nature of many of the issues associated with hydration care. However, in the current study, I developed two overarching themes of 'meanings and experiences of drinking' and 'caring roles' and by doing this, I was able to explore the way in which participants' views of drinks and drinking related to the caring roles of all the participants and identify the way in which residents involved themselves in their own care, a concept not identified by Godfrey et al, although the more medicalised settings of the acute ward and nursing home in her study may have accounted for this difference. In my commentary on Godfrey's study in Chapter 2 (section 2.12), I noted that her study had not identified some issues which may have an impact on drinking, because many people often mention them anecdotally, and these were issues to do with cleanliness and unpleasant odours, but the participants in my study did not discuss them either. Whereas Bernoth's interview study with families in Australia did identify cleanliness of crockery and staining of residents clothes to be significant barriers to drinking for care home residents[128]. Although Bernoth's study involved family members, it did not report on relationships between family members and staff in the way that my study did or the way that Mentes reported that family involvement had a positive effect on residents drinking[124].

In the UK, a study sponsored by Anglian Water, interviewed staff and reported that lack of staff training, staff's English language skills, promotional materials on hydration, residents remembering to drink and residents' concerns about micturition were the main barriers to residents drinking well. Kayser-Jones, in the US, also reported that lack of staff training and carers' language skills were probable causes of dehydration[126]. However, in my study, staff training was not discussed at length even when I asked specifically about it, which suggested that there may not be a great deal of training, although this is an assumption on my part, it is based on other evidence where staff described in detail positive practices relating to hydration care which they were involved with and there was a culture of being uncritical about the home they were associated with. None of the participants in any of the groups discussed any difficulties relating to carers' language skills.

Similarly, there was no discussion in any of the focus groups about drinking in relation to cultural or religious practices, issues which had been highlighted in two other studies[122,128], and a further issue which did not arise in my study was depression and loneliness amongst care home residents which Mentes reported on in her focus group study with care home staff. In Mentes' study, staff thought that depression and loneliness may be barriers to drinking, and that they, as staff, may have contributed to these feelings by having insufficient time to sit and talk to residents[124].

Studies which have reported on findings not identified in my study demonstrate the multiplicity of factors involved in hydration care, and just because some issues were identified as relevant in some settings and not in others, does not necessarily mean they are irrelevant in other settings.

Two studies reported on communication issues in relation to their effect on supporting residents to drink. In Australia, Ullrich, after observing how staff interacted with residents in a dementia unit to support drinking, concluded that communications between staff tended to be verbal but that written records would facilitate communications to inform colleagues of actions taken and this would promote adequate fluid intake[125]. Mentes also reported that staff communications were seen as a problem, which could aid hydration if improved[124]. In neither study were there any indications of whether communications did improve hydration care or that written records were any more effective than verbal communications. In my study three of the four staff groups discussed using verbal communications as the primary method and one staff group indicated that they were also very reliant on written records.

In the US, Kayser-Jones' findings that clinical, socio-cultural and institutional factors all contributed to dehydration in older nursing home residents were similar to the findings in my study[126].

6.6.3 Limitations to this study

There are a number of limitations to this study. Firstly, the plan for the study was to convene between six and eight focus groups, each comprising around six-eight participants, assembled in accordance with the purposive sampling strategy. This estimate was based on practical and theoretical considerations. Practically, Morgan suggests that saturation point is usually achieved by six groups (each comprising 6-8 members)[208], although this applies to focus groups with one type of participant and I had four types of participant, and an unmanageable number of care home types if I was to try and be representative of care homes in terms of care provided, size, ownership and location. Theoretically, the number of participants and focus groups required should be determined by the process of analysis, which occurred concurrently with data collection, with data collection ceasing when saturation point was reached (an intellectual judgment determined by the lack of new themes emerging from the analyses[198,208]). This was a difficult judgment to make in this study, because of the considerable variation in themes reflected even in this small range of participant and care home types. However, this may simply indicate the richness of this dataset.

Of the three residents' groups, one was based in a residential home, one in a nursing home (although these two participants did not converse well) and the final one was in a home providing housing-with-care. Thus, participants could be seen to have very different needs, and provided diverse insights into hydration care. Similarly with the staff groups; both senior staff groups were based in homes specialising in dementia care, and whilst there were similar issues around their residents' cognitive abilities, they seemed to deal with them in different ways, and although the homes were very different in terms of size, it is impossible to know if this was the only underlying reason. The two frontline staff groups were very different too, not just because one staff group worked in a residential home and the other group provided specialist dementia care, but the dynamic was also very different. In the first group staff seemed to know each other well and worked together often, whereas in the second group the staff did not appear to have worked together regularly and there was not the same rapport.

Unfortunately, there was just one family group, and although this was the most difficult group to recruit, and participants were associated with two different homes (of the four I contacted), the participants were animated, discussed shared experiences at length, supported each other, and had to be persuaded to end after 60 minutes. This group had strong views on some aspects of care, so it would have been beneficial if I had been able to recruit another group to assess whether other families had similar perspectives.

Thus, while there may have been some uncertainty about reaching saturation point, there is also some debate as to whether this is always necessary. Sandelowski[280] suggests that where a sample is based on particular criteria, this can enable a small research study to produce credible findings and I have reported on a considerable number of findings not previously reported on in this field.

A second limitation particular to this study was the possible exclusion of residents who would have found it difficult to participate in a focus group. Focus groups, by definition, are conversations between people, and some people, especially residents, may find this difficult due to social, physical, sensory and/or cognitive reasons, or diminished confidence affecting their ability and willingness to participate and contribute to the discussions. Whilst I took steps to enable participants to take part who were experiencing some of these difficulties (section 6.3.2.2), I was aware that I was unable to accommodate participants who may have required more substantial help, such as residents with dysphasia who may have needed support to express themselves. Thus, it is likely that some issues which may have been particularly pertinent to these groups of people may have been left unexplored within the focus groups.

A third limitation was the possibility that sensitive issues were not raised or if they were, they were not discussed in depth. Whether using focus groups, as a data collection method may have inhibited these kinds of discussions is unknown, with some authors suggesting that focus groups may promote the discussion of sensitive topics due to the open forum and sharing of experiences, (e.g. Kitzinger[224]), others suggest the opposite, advising that sensitive issues may be better explored in one-to-one interviews[281].

In this study, there was no discussion about:

- Depression and loneliness and its effects on drinking.
- The cleanliness of the crockery in which drinks were served.
- Personal discomfort, apart from arthritis, and its effects on drinking.
- Preferences about drinking alone.
- Residents with aversive behaviours affecting drinking; staff talked about this, but residents did not.
- Residents did not talk about the possibility of being embarrassed by their own lack of social skills.
- The CQC.

And I felt that there was more to say on:

- The use of drinking aids, in particular:
    - the kind of training staff may receive about the use of aids
    - the decision-making process supporting the kinds of aids which are purchased and available
    - the decision-making process around deciding which residents should use which aids
    - the way in which residents may be involved in the decision-making process
    - residents feelings regarding stigma and the use of aids
    - whether staff and families have any other thoughts about stigma and the use of drinking aids
- The way in which staff balanced safety with meeting preferences, such as providing hot drinks in a preferred cup, or leaving drinks accessible in homes where residents have severe cognitive difficulties.
- Assistance required with toileting, including residents feeling able to ask for help.
- Training, the kind of training staff received and what staff felt about it.
- Staffing levels, whether staff felt staffing levels were adequate.

It is always difficult to account for why some issues were not discussed at all, or were not discussed in depth in the way the researcher would have liked. Omissions are difficult to interpret, as it is not known whether they were simply omissions, not relevant to the participants or whether they were sensitive subjects which participants were reluctant to address in the focus groups. It is also worth bearing in mind, that whilst there may have been some omissions, by allowing other conversations to occur, other issues may have been discussed which would not have taken place otherwise. The challenge of a qualitative study is being aware of the many types of possibilities, and that each study provides a unique insight, and it is putting this in context.

Finally, there was a limitation in the manner of reporting some findings. In order to preserve anonymity I have been necessarily vague in some areas.

6.6.4 Strengths of this study

There are few studies which have explored the views and experiences of residents and their network of carers about issues which may help or hinder older residents to drink well, with many studies using observational methods and/or eliciting staff views rather than involving residents themselves. Wu interviewed Chinese residents of a US nursing home[122] and Godfrey et al involved residents and patients as well as their families and staff, albeit using different data collection methods with each group[120]. Only two studies involved families[120,128]. Therefore, this is the first study to use a single method of data collection to explore the emic perspectives of residents and their network of carers about drinking and hydration care within care homes, inviting residents, family members, frontline and senior staff to attend separate focus groups in order to explore perspectives according to each participant type and make comparisons between them. As such, this study has provided a broader and a more in-depth view of the salient issues.

A further strength of this study was its trustworthiness and rigour. I adhered to the four components described by Lincoln and Guba (section 6.3.4). The credibility of this study arose from the philosophical underpinnings of the study based on the internal consistency between the ontology, epistemology and methodology, whereby I used an interpretive approach based on relativism and subjectivism, and used focus groups to gain insights into the emic perspectives of residents, carers and families to more fully understand hydration care in care homes.

This is a unique study, but the transferability of the findings to other contexts is aided by the detailed descriptions I have provided in reporting the conduct and findings from this study. This detail, and the reflexive manner in which I have reported the study contributes to its dependability, and the confirmability of this study is the way in which I have addressed the research question, demonstrating that I have investigated and reported on the views and experiences of residents, families and carers in supporting residents to drink well to prevent dehydration.

6.7 Publications arising from Chapter 6

I have one publication arising from this chapter.

- Bunn DK, Hooper L, Poland, F. Thinking about Drinking: an exploratory study to identify drivers and barriers to maintaining hydration in older care home residents. 2015. Oral presentation. British Society of Gerontology 44th Annual Meeting, Newcastle. http://conferences.ncl.ac.uk/bsg2015/.

6.8 Summary and conclusions from Chapter 6

This study aimed to explore the views and experiences of residents, families and staff to understand issues which may help and/or hinder residents to drink well, from the experiential perspective of those directly involved.

I conducted a qualitative investigation using an interpretive approach underpinned by ontological and epistemological assumptions of relativism and subjectivism respectively.

My research strategy was to include residents, families and care staff in focus groups to discuss their views and perspectives of drinking and hydration care in care homes – what may help and what may hinder. Using purposive sampling, I recruited 29 participants to take part in eight focus groups. Discussions were recorded, transcribed and analysed thematically.

Three themes and twenty sub-themes were identified. The themes were: ‘the meaning and experiences of drinking’, ‘caring roles’ and ‘tensions and barriers to successful drinking’. Findings were described and discussed under the sub-theme headings.

This study was unique in that it included residents, families, frontline and senior care staff to participate in a study specifically related to hydration care and drinking in care homes and the same data collection method was used for all four groups, enabling comparisons to be made across groups.

Few qualitative studies have investigated hydration care in care homes, and those that have used a number of different research methods and so comparisons between studies are limited. This study reported on two themes (‘the meaning and experiences of drinking’ and ‘caring roles’) which increase our understanding of hydration care, with the third theme (‘tensions and barriers to successful drinking’) providing insights into the challenges. Some of the sub-themes have been consistently found across studies, whilst a number of others have been reported for the first time in this study, and some findings which have been reported in other studies were not identified here.

The large number of findings identified in this study have provided many new and novel insights into the views and perspectives of residents, families and staff views relating to drinking in care homes and this should contribute to our understanding of how to improve drinking and prevent dehydration in care homes.

Whilst it is reassuring to note that some of my findings mirror those from earlier studies, my study has revealed considerably more perspectives, which have not been identified previously in relation to hydration care and many of these could be developed further to inform practice.

Chapter 7: Discussion and conclusions

7.1 Contributions

I have written this chapter.

7.2 Aim and introduction to Chapter 7

In this chapter I will describe the methods used for integrating the findings from the three component studies included in this thesis, and the meta-inference from the synthesis. The discussion will describe how the aims, research question and purpose for this thesis have been addressed, the strengths and limitations of this mixed methods study and the final results and conclusions will be presented.

7.3 Conclusions from the three individual studies

7.3.1 Diagnostic Accuracy study (Chapter 4)

A cross-sectional diagnostic accuracy study set in 56 care homes in Norfolk and Suffolk recruited 188 residents during 2012-3 to assess the utility of clinical signs and symptoms to screen for water-loss dehydration in older people. None of the 56 commonly-used signs and symptoms was able to discriminate between older residents with or without water-loss dehydration.

7.3.2 The Systematic Review (Chapter 5)

The systematic review investigated the effectiveness of interventions and the extent of any associations with modifiable environmental factors to increase drinking and/or prevent dehydration in older care home residents. The review, which included 23 studies, identified a range of interventions and associations which had been investigated at the societal (‘macro’), institutional (‘meso’) and carer (‘micro’) levels, but due to the high risk of bias present in the majority of studies, findings for any particular intervention or association were inconclusive. The nine studies which investigated multi-component approaches at micro and meso levels to help residents increase their fluid intake seemed to show a positive trend when taken together.

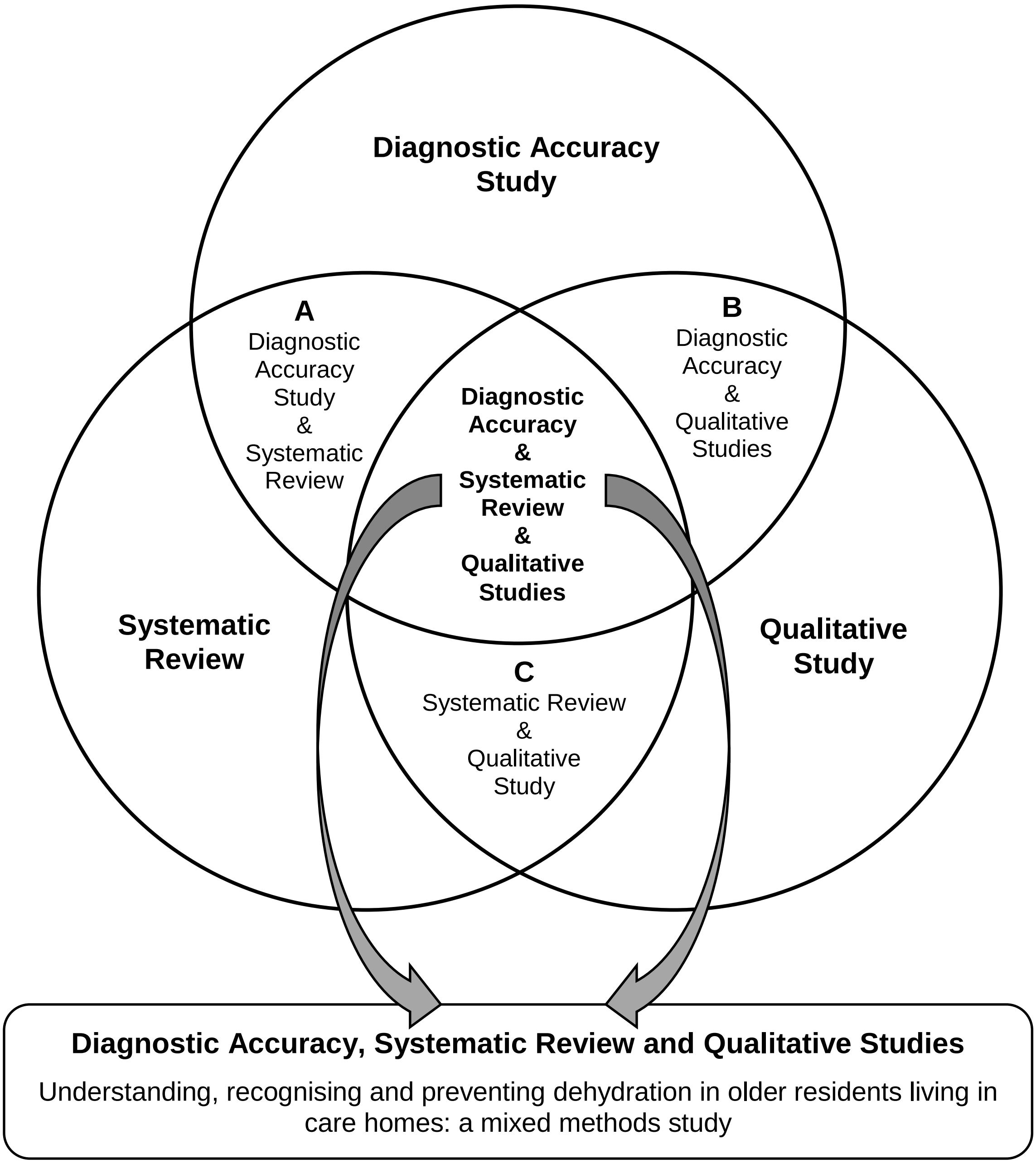
7.3.3 Qualitative Study (Chapter 6)

Twenty-nine participants (residents, families, frontline and senior staff) took part in eight focus groups across Norfolk and Suffolk during 2014 to talk about their views and experiences of drinking and hydration care in care homes. Three themes and twenty sub-themes were identified (Table 6-3). The themes were: ‘the meaning and experiences of drinking’, ‘caring roles’ and ‘tensions and barriers to successful drinking’.

7.4 Integrating the findings from the three component studies

This mixed methods thesis followed a convergent parallel design, where the three component studies were conducted independently of each other, and the findings from each study integrated when all studies were completed. This is in contrast to the two other commonly used mixed methods designs where studies follow sequentially, with the findings from one study contributing to the development of the next stage (exploratory and explanatory sequential designs)[20]. Although the findings of each of the three studies in this mixed methods study were not integrated until the final stage, at an earlier stage during the planning and data-collection phases there was interplay between the studies methodologically (Figure 7-1). The knowledge required to plan and conduct the diagnostic accuracy study about the different methods of assessing dehydration informed my assessment of the validity of the outcome measures used by studies included in the systematic review. The systematic review increased my understanding of different strategies and factors investigated to increase fluid intake and prevent dehydration, which informed my thinking as I planned the qualitative study. The data-collection phase of the diagnostic accuracy study provided me with the practical experience of working in care homes and meeting with staff, residents and families so I had experience of care home organizations and cultures, which informed my thinking when developing the Topic Guide for the qualitative study, and I was able to draw on this knowledge when facilitating the focus group discussions. The synergy of the interacting experiences of working on each component study contributed to the robust conduct of each of the studies, as well as the final integration.

Figure 7-1: Interplay of the three component studies in this thesis



A Diagnostic Accuracy and Systematic Review overlap: the diagnostic accuracy study provided underpinning evidence to assess quality of outcome measures in the systematic review.

B Diagnostic Accuracy and Qualitative overlap: the interviews for the diagnostic accuracy study provided practical skills, experience and knowledge of working in care homes.

C Systematic Review and Qualitative overlap: the systematic review provided underpinning knowledge about care home practices to support drinking for the focus groups.

7.4.1 Methods for integrating findings

As an emergent methodology, guidelines for judging the quality of mixed methods research are the subject of ongoing debate[20]. In the absence of universally agreed guidelines Creswell suggests that mixed methods studies should utilise a recognised mixed methods design and that rigorous quantitative and qualitative methods should be used for the component studies, followed by independent data analysis for each study prior to integration[20]. These quality criteria have been followed in this mixed methods study.

To integrate the findings a table was constructed to plot the findings from the three component studies (Table 7-1). From the qualitative study, the two themes and their sub-themes (‘meaning and experiences of drinking’ and ‘caring roles’) were displayed horizontally across the top of the table. The included studies of the systematic review, together with the subject area of investigation, were listed vertically. Where there was overlap between a review study’s area of investigation and a sub-theme from the qualitative study, the intersection is shaded. If there was overlap with either of these studies and the diagnostic accuracy study, then this was indicated by the abbreviation (‘DA’) in the relevant intersection. For example, anecdotes around drinking were discussed in the qualitative study, but not at all in the systematic review. In the diagnostic accuracy study, two index tests were included following conversations with carers who had told us they were using them anecdotally.

Table 7-1: Integrating the findings from the diagnostic accuracy study ('DA'), the systematic review and the qualitative study

		Meaning and experiences of drinking										**Caring roles**						
		Tensions and barriers to successful drinking																
	Qualitative ('Qual') study themes and sub-themes	Reminiscing and hospitality	Anecdotes	Changing drinking habits	Views about drinks preferences	Residents realising drinks preferences	Drinking serving a purpose, having a reason to drink	Availability of drinks	Drinking practices relating to micturition	Effects of the social & physical environment on drinking	Costs	Residents' care needs for drinking	Residents managing their own drinking	Family member's roles as carers	Care home roles to support drinking	Staff meeting needs	Fostering sense of well-being amongst staff, residents & FM's	Care staff's frustrations with external criticisms about poor care
Included studies in the Systematic Review (SR) & area of investigation	**<u>OVERLAP</u> DA/QUAL only▶ DA/SR only▼**		**DA**	**DA**			**DA**		▨		**DA**	**DA**			**DA**	**DA**		
Allen, 2011[185,188]. Carton vs glass								▨										
Allison, 2005[175]. Multi-component												▨			▨			
Cleary, 2008[182]. Seating plan										▨		▨						
Dunne, 2004[176]. Cup colour								▨				▨						
Dyck, 2006[49]. CH type, CH location staff/resident ratio	**DA**														**DA**			
Fries, 1997[177]. RAI implementation	**DA**											**DA**			**DA**			

(continued on next page)

	Qualitative ('Qual') study themes and sub-themes	Meaning and experiences of drinking										Caring roles						
		Tensions and barriers to successful drinking																
		Reminiscing and hospitality	Anecdotes	Changing drinking habits	Views about drinks preferences	Residents realising drinks preferences	Drinking serving a purpose, having a reason to drink	Availability of drinks	Drinking practices relating to micturition	Effects of the social & physical environment on drinking	Costs	Residents' care needs for drinking	Residents managing their own drinking	Family member's roles as carers	Care home roles to support drinking	Staff meeting needs	Fostering sense of well-being amongst staff, residents & FM's	Care staff's frustrations with external criticisms about poor care
Gaspar, 1999[52]. Availability of drinks								▨				▨						
Holzapfel, 1997[118]. Feeder's position												▨				▨		
Kenkmann, 2010[108]. Multi-component	**DA**					▨		▨		▨		**DA**						
Lin, 2013[68]. Advice + target							▨					▨	▨		▨			
McCormick, 2006[186,189]. Thickening								▨				▨			▨			
McGregor, 2006[183]. CH type, CH size	**DA**														**DA**			
Mentes, 2000[178]. Multi-component	**DA**				▨	▨		▨		▨		**DA**	▨		**DA**	▨	▨	
Reed, 2005[179]. CH type, CH size, staff/resident ratio, staff training, thickening of drinks, environment								▨		▨					▨			
Robinson, 2002[59]. Multi-component	**DA**				▨	▨		▨		▨	**DA**	**DA**			**DA**			

(continued on next page)

		Meaning and experiences of drinking										Caring roles						
		Tensions and barriers to successful drinking																
	Qualitative ('Qual') study themes and sub-themes	Reminiscing and hospitality	Anecdotes	Changing drinking habits	Views about drinks preferences	Residents realising drinks preferences	Drinking serving a purpose, having a reason to drink	Availability of drinks	Drinking practices relating to micturition	Effects of the social & physical environment on drinking	Costs	Residents' care needs for drinking	Residents managing their own drinking	Family member's roles as carers	Care home roles to support drinking	Staff meeting needs	Fostering sense of well-being amongst staff, residents & FM's	Care staff's frustrations with external criticisms about poor care
Schnelle, 2010[60]. Multi-component + toileting								▨	▨			▨			▨			
Simmons, 2001[113]. Multi-component + toileting	**DA**				▨			▨	**DA**			**DA**			**DA**	▨		
Spangler, 1984[114]. Multi-component + toileting	**DA**				▨			▨	**DA**	▨					**DA**	▨		
Tanaka, 2009[115]. Multi-component + toileting					▨			▨	**DA**						**DA**			
Taylor, 2006[184]. 3 vs 5 meals/day								▨										
Welch, 1996. Advice, goal-setting, hydration solution,	**DA**						**DA**								**DA**			
Willms, 2003[111]. Multi-component					▨		▨	▨		▨	▨	▨			▨	▨		
Zembrzuski, 2006[181]. Multi-component					▨			▨		▨					▨			

7.4.2 Integrated findings

Table 7-1 demonstrated the overlap between the findings from the diagnostic accuracy, systematic review and qualitative studies. The systematic review and the qualitative study both identified a comprehensive range of issues relating to hydration care and Table 7-1 illustrated how all the issues relating to hydration care which were described in the included studies in the systematic review were identified as sub-themes in the qualitative study. However, the reverse was not observed, where more sub-themes emerged from the qualitative study which had not been addressed in the studies included in the systematic review. Some findings of the diagnostic accuracy study were pertinent to both the systematic review and qualitative study. The diagnostic accuracy/systematic review overlap occurred when included studies in the systematic review had used a clinical sign or symptom as an outcome measure. The diagnostic accuracy/qualitative study overlap related more to the way in which signs and symptoms of dehydration related to some of the sub-themes in the qualitative study.

The way in which overlap occurred will be explored further, examining the way in which the findings from the three component studies converged, complemented or appeared to disagree (‘dissonance’) with each other. The sub-themes from the qualitative study are used as section headings, and as in Chapter 6, the sub-themes relating to the third theme ‘tensions and barriers to successful drinking’ will be discussed when relevant. The possible impact of the integrated findings on care is also discussed.

7.4.2.1 Reminiscing and hospitality

In the qualitative study, residents reminisced about drinking experiences at different times during their lives with a number of descriptions of the way in which drinking was associated with hospitality (section 6.5.3.1). For residents, being able to provide drinks for their visitors as a form of hospitality was either no longer possible, or visitors were encouraged to do it for themselves. Families and staff did not discuss offering drinks as hospitality in this way, but they did talk about visitors drinking with residents as a means of encouraging residents to drink, reflecting social facilitation and social modelling aspects of drinking. Social facilitation relies on people drinking more when drinks are taken together in a social situation, social modelling relies on people who do not drink well to imitate those who do, whereas hospitality relates to a transactional and gift relationship between people, which may also result in people drinking more, but it is a distinct social situation.

The systematic review identified a number of studies where social facilitation and social modelling were featured, but none of the review studies referred to drinking as a form of hospitality or how it could be incorporated into the current setting as a way in which residents could welcome their visitors. One possible way of achieving this would be for care homes to provide an area where visitors could make their own drinks and which residents felt comfortable directing them to, so that residents could continue to offer drinks as hospitality, even if they could not actually make drinks themselves.

7.4.2.2 Anecdotes

Many of the focus group participants shared their personal experiences of what it felt like when they had not drunk sufficiently, describing a number of symptoms such as thirst, headaches, faintness and dark-coloured urine. Families and staff described how they used these experiences to empathise with the residents they cared for. In the diagnostic accuracy study we demonstrated that these clinical signs and symptoms were ineffective in detecting water-loss dehydration, thus there seemed to be some dissonance between the diagnostic accuracy findings and the experiences of participants as described in the qualitative study. This dissonance needs to be explored further, and could relate to a number of factors, such as the way in which the questions were asked in the diagnostic accuracy study, or the heightened awareness of dehydration in the qualitative study resulting in participants linking symptoms to dehydration rather than other possible causes. Interestingly, the participants describing these symptoms (carers and families) were all aged >65 years themselves, except for one carer who was 59 years.

The way in which personal experiences may influence how carers provide care was not described in any of the included studies in the systematic review. Although training for facility and research staff was a component in some studies, the format of this training and in particular whether it explored and related carers' own experiences to the help they were expected to provide for residents, was not described.

The way in which carers related personal experiences to how they delivered care should be explored further, investigating how positive and detrimental experiences could impact on hydration care.

7.4.2.3 Changing drinking habits

Participants in the qualitative study talked about their views regarding their own and other people's drinking habits and the way in which these seemed to have changed over time.

Understanding how and why drinking habits may change over time, and how drinking habits may differ between age-groups are important to be aware of when developing ways of preventing dehydration and supporting residents to drink. Residents, whilst describing life-long habits, also described how they adapted to living in care homes and how they responded to advice to change their drinking habits for health reasons, indicating that advice and information may be effective. This finding is particularly relevant when considering one of the diagnostic accuracy study's findings where the thirst sensation was found to be an ineffective symptom of current dehydration. Information for residents and carers should include advice about not relying on thirst as a stimulus to drink, and to develop alternative drinking habits as a way of adapting to a diminishing thirst sensation.

Similarly, if younger carers have different drinking habits from the older residents in their care, and the delivery of care is informed by the carers' own experiences, then we need to understand these habits and experiences more fully and how they impact on residents' drinking.

Whilst some of the studies included in the systematic review investigated how advice and information for residents could help improve fluid intake, few details were provided about the nature of this advice and whether information about the ineffectiveness of the thirst sensation was included.

7.4.2.4 Views about drinks preferences

Participants in the focus groups described the kinds of drinks they liked, how and when they were served. For the families and staff who were independent and responsible for their own drinking, they could make and implement their own choices for themselves. When talking about residents in their care, staff talked about the kinds of choices they were able to offer, and how they 'knew' what kinds of drinks residents liked, but offering each resident a choice at each drinks round was time consuming and therefore not possible. For residents who are dependent on carers for drinks provision, the extent of their available choices was determined by their carers, and this was not always as extensive as they or their families would like, with families describing how their relatives' choices were not always met.

In the systematic review, seven of the included studies[59,111,113–115,178,181] reported offering residents a choice of drinks and in five of these the intervention was conducted by the research staff, so there were extra staff involved[59,113,114,178,181] who had the time required to offer choice. Just one study in the review addressed the issue of how much extra time was required to conduct a drinks round if residents were provided with a choice of drinks each time[59].

7.4.2.5 Residents realising drinks preferences

In the qualitative study, residents, families and staff described the ways in which residents managed their drinks preferences. Residents seemed reluctant to state that they disliked drinks or to make specific requests, preferring instead to adapt and alter their preferences within the bounds of what was being offered, so a resident being offered a choice of tea or coffee may be happy to choose one or the other, but unless the offer of choice continued beyond that (for example weak or strong coffee, caffeinated or decaffeinated, etc), residents would prefer not to say, accepting the drink that was being offered, and then choosing whether to drink it or not. Staff and families described how residents refused drinks they disliked.

In the systematic review, four of the included studies[59,111,113,178] reported that personal requests were honoured when staff (either facility or research staff) offered a choice of drinks during the trial. However, in these studies there was a lack of information to determine whether ‘honouring requests’ referred to a type of drink, how the drink was made and served or how residents were enabled to make personal requests.

Residents depend on staff to provide their drinks, and if this is not to their liking, residents tend not to say anything to the staff, choosing to either change their preference or not drink at all, rather than drink something they dislike. However, for staff, providing choice at each drinks round for every resident is time-consuming, so they are reliant on ‘knowing’ their residents to provide the preferred drink.

Providing choice seems to be an essential element of ensuring residents drink well, but this poses problems for staff to deliver within the current care home systems and routines.

7.4.2.6 Drinking serving a purpose, having a reason to drink

In the qualitative study, all participants described a range of reasons about why they may or may not drink. Health reasons were discussed, both the advantages and disadvantages of drinking generally as well as describing how the properties of certain types of drinks may be beneficial or detrimental for their health. Social and psychological reasons for drinking and refraining from drinking were also discussed by all participants.

The qualitative study provided more depth than was reported in many of the studies included in the systematic review. Although the 'raison d'etre' of these studies was to promote drinking to prevent dehydration and its possible sequelae, most studies in the review focussed on increasing drinking to prevent dehydration, and did not acknowledge that residents may drink for other reasons.

Recognising the many reasons why residents drink or do not drink and the situations when they enjoy drinking or prefer not to drink increases understanding of how to provide a range of opportunities to support residents to drink.

7.4.2.7 Availability of drinks

Increasing the availability of drinks provides increased opportunities for residents to drink. Increasing the frequency of drinks provision to increase fluid intake was recognised in eleven of the SR studies[52,59,60,108,111,113–115,178,181,184] as well as by the staff and families in the qualitative study. Residents did not attribute drinking more to increased availability or decreased drinking to lack of availability in such an explicit way, although they alluded to it.

The routines of drinks rounds were seen by all the focus group participants as being important: for residents they were reassuring, knowing that they would receive a drink, so that they did not 'bother' staff unnecessarily between-times; families were reassured that at least a drink was being offered (and making sure their relative drank it was the next step), and staff, too, saw drinks rounds as being crucial in ensuring that each resident was offered a drink at regular intervals. In the review a number of studies[59,60,111,113–115,178,181] introduced regular drinks rounds as part of multi-component interventions, with some indicating that they were introducing between-meal drinks rounds for the first time. Both the systematic review and the qualitative study seemed to suggest that routines, because they are associated with an active offer of drinks, are an essential component of hydration care.

Availability of drinks also refers to how drinks are accessed – the vessel in which drinks are served, and whether these are acceptable to the resident and their carers.

Participants in the focus groups talked about a number of relevant characteristics relating to drinking vessels including how easy they were to hold, the difficulties caused by small handles and heavy cups, and the embarrassment of plastic cups which squashed easily, so spilling the drink. Residents pointed out that a favourite cup or glass made drinks more appealing. In the systematic review, seven of the included studies investigated whether changes to the drinking vessel altered fluid intake. Changes in design, colour and the material the drinking vessel was made out of were investigated, but these were generally seen as practical considerations to physically aid drinking and increase fluid intake, rather than due to any aesthetic considerations. The type of cup or glass residents drank from seemed to affect the experience of drinking from both practical and aesthetic viewpoints. In the UK there is a large choice of inexpensive crockery available to purchase, so that a relatively easy way to support residents to drink would be to enable each resident to choose their own cup and glass. The consequence of this is then to develop a system to ensure that residents always received their drinks in their preferred cup or glass.

Dinking aids designed to help a person drink independently are widely used in care homes. In both the qualitative study and the studies included in the systematic review there were few discussions about their use, the process by which a resident started to use an aid or how drinking aids were chosen to meet particular needs. Additionally, there was little discussion about how using a drinking aid may be stigmatising for the residents, although one of the carers seemed to suggest that if residents used them this would be stigmatising for the care home.

The way in which drinking aids are used (or not used) in care homes requires further exploration.

7.4.2.8 Drinking practices relating to micturition

Increased fluid intake increases urine output and hence may affect continence and the need to visit the toilet (with or without help). The systematic review included four studies[60,113–115] where additional toileting assistance or continence care were part of a multi-component intervention, although due to the high risk of bias in these studies there was no conclusive evidence that additional toileting assistance increased fluid intake or prevented dehydration.

In the qualitative study, participants discussed how some residents reduced fluid intake due to anxieties about increased need for the toilet, especially at night or when going out, but participants did not talk about whether residents drank more at other times to compensate and therefore whether anxieties about needing the toilet are a contributory factor for low fluid intake or dehydration. Whilst staff talked about how residents should not be embarrassed about needing help with toileting, and that providing help was part of their caring role, residents did not discuss toileting assistance at all, although some residents, but not all, talked about how they restricted their drinks intake to avoid the inconvenience of getting up in the night.

7.4.2.9 Effects of the social and physical environment on drinking

The way in which the environment can affect drinking was discussed by families and staff in the focus groups, and was investigated by many of the studies included in the systematic review. Studies in the review reported on the communal areas and the need for them to be less institutionalised, mirroring more ‘homely’ environments, as well as promoting the benefits of drinking with other people – ideas which were discussed in a similar way by many of the staff and families in the focus groups (section 6.5.3.9). However, in the qualitative study, only the staff and families discussed issues about some people preferring to stay in their room to drink, or the negative effects on drinking when sitting with other residents who were unable to drink without spilling or choking. Residents did not discuss these issues at all and neither did they discuss in any detail what they considered to be a pleasant environment in which to take a drink. It is possible that environmental factors and their impact on drinking may not be important to residents, and the idea that they are important is a viewpoint held only by staff, families and researchers, but further research is needed in this area.

7.4.2.10 Costs

Monetary costs featured in two of the included studies in the systematic review with one study providing cost estimates to implement the intervention as part of routine care, compared to the negative costs associated with dehydration[59]. The other study mentioned that the choice of drinks provided in the intervention were not too costly for the care home[111]. Many of the interventions described in the systematic review studies would have had a cost implication for the care home, such as costs of drinks, cups and particularly staff time, but these were not addressed.

In the qualitative study, staff and residents talked about costs of some favourite drinks, but not in any depth.

In the diagnostic accuracy study, if any of the commonly-used clinical signs and symptoms of dehydration had been shown to be effective, one of the key benefits would have been their economic viability because the tests we were trialling required minimal time, equipment and staff training to conduct them.

In all three of the component studies, additional costs were not directly linked to being a barrier to drinking.

7.4.2.11 Residents' care needs for drinking

In both the qualitative study and the studies included in the systematic review, it was generally accepted that residents had care needs for drinking, and that staff were there to meet those needs. Some more specific care needs were identified in both studies, including needs related to mobility, arthritis, dysphagia, sleepiness, visual impairments and cognitive difficulties. In the qualitative study, carers described the specific ways that they addressed some of these needs, whereas descriptions in the systematic review studies tended to be more generic.

In the diagnostic accuracy study, a number of the index tests could not be undertaken because of residents' physical or cognitive difficulties. Most notably, none of the urine tests could be performed in residents who were incontinent, standing blood pressure measurements could not be obtained in residents who were unable to stand and foot assessments could not be undertaken in those residents with oedematous or bandaged feet. If any of these tests had demonstrated any potential in screening for dehydration, then further investigations would have been required for those residents where we were unable to conduct a test. One of the analyses in the diagnostic accuracy study was to investigate the diagnostic potential of being able to conduct a test vs being unable to.

7.4.2.12 Residents' role in managing their own drinking

In the qualitative study, findings indicated that residents were actively involved in managing their own drinking, that they wished to be involved and that they listened to advice. Staff who were based in a residential home described providing advice to residents but found that some residents had difficulty remembering it. For staff and families caring for people with moderate to severe dementia, providing advice was seen as meaningless. In the systematic review only three studies described involving residents in any way in their own care by providing advice[68,111,180] although how and what advice was provided was not described in detail.

In addition to listening to advice, residents talked about other ways in which they managed their own drinking, including monitoring their intake and adapting their preferences to fit in with the care home routines. Thus, residents, where they were able, were actively involved in their own care and recognising this and developing ways of extending this role may benefit residents.

This finding was reiterated by the advice and active involvement of the resident members of the three Resident Advisory Groups who I worked alongside during the course of these studies.

7.4.2.13 Family members' roles as carers

The way in which families could contribute to the care of their relative was under-acknowledged, both by the staff participants in the focus groups, and by the included studies in the systematic review, where only two studies mentioned any kind of family involvement, and in both cases this was encouraging families to join their relative for a meal, rather than being more directly involved in care.

In the qualitative study, residents talked about listening to advice from families, and families expressed their wish to be involved in the daily care of their relative, but found that they were generally not encouraged to do so, and instead they felt that their wish to be involved was seen as threatening or a criticism of the staff's care. Staff experiences of family involvement reiterated this view, seeing family involvement as interfering or a criticism of their care, but they also pointed out that many families did not have the skills or were reluctant to be involved, finding their relative's deterioration in health upsetting.

The qualitative study seemed to highlight differing viewpoints between families and staff, building areas of mutual distrust. Greater understanding of each other's expectations and roles, as well as improved communication between care staff and families could be beneficial for residents, particularly those who need support with drinking.

7.4.2.14 Role of care homes to support residents' drinking

There was universal acknowledgment by all participants in the focus groups, as well as the studies in the systematic review, that care staff had a responsibility to support residents to drink well, to provide assistance appropriate to need and to prevent dehydration. Findings from the systematic review studies indicated that care is required at the macro (societal), meso (institutional) and micro (carer) levels.

In the systematic review, macro factors included national guidelines, monitoring, management structures, size of care home, type of care provision, staff/resident ratios, staff grades and training, and how these impacted on care. The focus group participants said very little, if anything, about any of these issues and when they did, their viewpoints were much more about how these factors related directly to day-to-day care. In one of the focus groups, staff from a smaller home commented that their small size enabled them to deliver more personalised care, and communications between staff were easier.

In the systematic review, a number of studies included training as part of the intervention, or analysed associations between training or level of qualifications and dehydration. In the qualitative study, there was little mention of training, and staff seemed to rely on care home systems, guidelines and routines to guide them in their care, as well as relying on their own experiences and those of their colleagues to inform their practice. There is insufficient research to know whether formal training programmes for staff, or experience, or a combination of both are beneficial in supporting residents to drink.

At the meso level, staff participants in the focus groups discussed how they supported each other, both informally and formally within the organisational structure of the care home. Only one review study reported on staff support and this related to the staff support required to implement the intervention by the researchers, rather than the support between staff to provide routine care[178].

One aspect of care home systems discussed at length in both the qualitative study and many of the systematic review studies was the way in which residents' fluid intake was monitored as a means of ensuring adequate fluid intake (qualitative study) or as an effective outcome measure (systematic review) in both instances it was assumed that these fluid charts were accurate records, despite research evidence to the contrary[239]. Families were particularly keen on these charts because they were a visible record providing reassurance that their relative was drinking enough. Achieving a daily goal of fluid intake was described by a number of participants in the focus groups as well as a number of studies in the systematic review[59,115,175,178], but in order to know whether a daily goal has been achieved, intake needs to be monitored and recorded. It is unclear whether keeping fluid charts increases fluid intake, or whether they act as an alert and provide reassurance for staff and families that there are concerns about particular residents. Some focus group residents also described monitoring their own intake.

In addition to monitoring fluid intake, care staff and families discussed using signs of dehydration as part of their care to identify residents who did not drink enough and were becoming dehydrated. The signs which were used seemed to be an individual choice of the carer, rather than as a result of following a care home guideline. Many of the systematic review studies included clinical signs as outcome measures but were judged at high risk of bias as a result, due to their ineffectiveness in identifying dehydration (Figure 5-2).

Monitoring, whether monitoring fluid intake or signs of dehydration, is part of care. Monitoring fluid intake is known to be inaccurate, but the practice continues - probably because it is a visible sign that there is a concern and there are few alternatives. The findings from the diagnostic accuracy study are yet to be disseminated, so the impact of these findings on care is yet to be seen.

7.4.2.15 Staff meeting residents' needs

In the qualitative study, staff discussed the formal routines and care home practices which they followed to assess residents' needs so the appropriate care could be put in place. Staff also described the way in which 'knowing' their residents was crucial, so that needs could be pre-empted. This also included 'knowing' if someone needed a drink or was becoming dehydrated, because there were noticeable changes in behaviour. 'Knowing' residents in this way was also appreciated by residents as well as families who were concerned when their relative was being cared for by someone unknown to them. The relationship between carer and residents was valued by all participants in the qualitative study and seemed to be an important component of care not fully acknowledged in the researcher–led systematic review studies.

In addition, staff in the qualitative study discussed how their care was guided by care home policies, but they also drew on their own experiences by sometimes developing their own opinions and practices regarding the care they provided. This seemed to be the way in which staff coped with situations they faced for which they had no other means of knowing how to deal with, possibly through a lack of training, although this was never stated as such.

In the studies included in the systematic review, there was very little evidence or discussions of these kinds of practices, possibly because of the way that they would be interpreted as interfering with the intervention, but also personal intuitive care of this type cannot be manipulated as an intervention, although the value of personal interactions was recognised by some study authors and incorporated into some of the interventions where a 'friendly' approach' was stipulated[59,114].

7.4.2.16 Fostering sense of well-being amongst staff, residents and families

Within the focus groups, all participants displayed a sense of loyalty towards the care home with which they were associated, and whereas staff and residents voiced very few criticisms, families discussed their concerns more readily. In care homes where there is a supportive culture generally for staff, residents and families, it is likely that this could have a positive impact on the support residents need to drink more specifically.

The supportive culture between staff, between staff and residents and between families and residents seemed to have a positive impact on supporting residents to drink. The way in which both staff and families described tensions between themselves implied that these may have a negative impact on residents' drinking. If these relationships could be improved, it may well be to the residents' benefit.

Ways in which residents' drinking could be effected by the relationships between staff, families and residents and/or a sense of well-being in the home was not reported in any of the included studies in the systematic review.

7.4.2.17 Care staff's frustrations with external criticisms about poor care

In all the staff groups, staff talked about the frustrations of being criticised for delivering poor care by external agencies who had no personal knowledge of them or their care home, or the type of challenging work they undertook daily. There was no mention of such external criticism in any of the systematic review studies.

7.4.3 Discussion

The research question for this thesis was:

> *"How can we understand, recognise and prevent dehydration in older residents living in care homes?" (Section 3.3).*

In answering this question I undertook three studies designed to address each aspect of this question, and in doing so I adopted a convergent mixed methods design where the component studies were conducted separately and then the findings integrated to provide a meta-inference. In section 7.4.2, I demonstrated where the findings from the three component studies in this thesis converged, complemented and/or disagreed with each other.

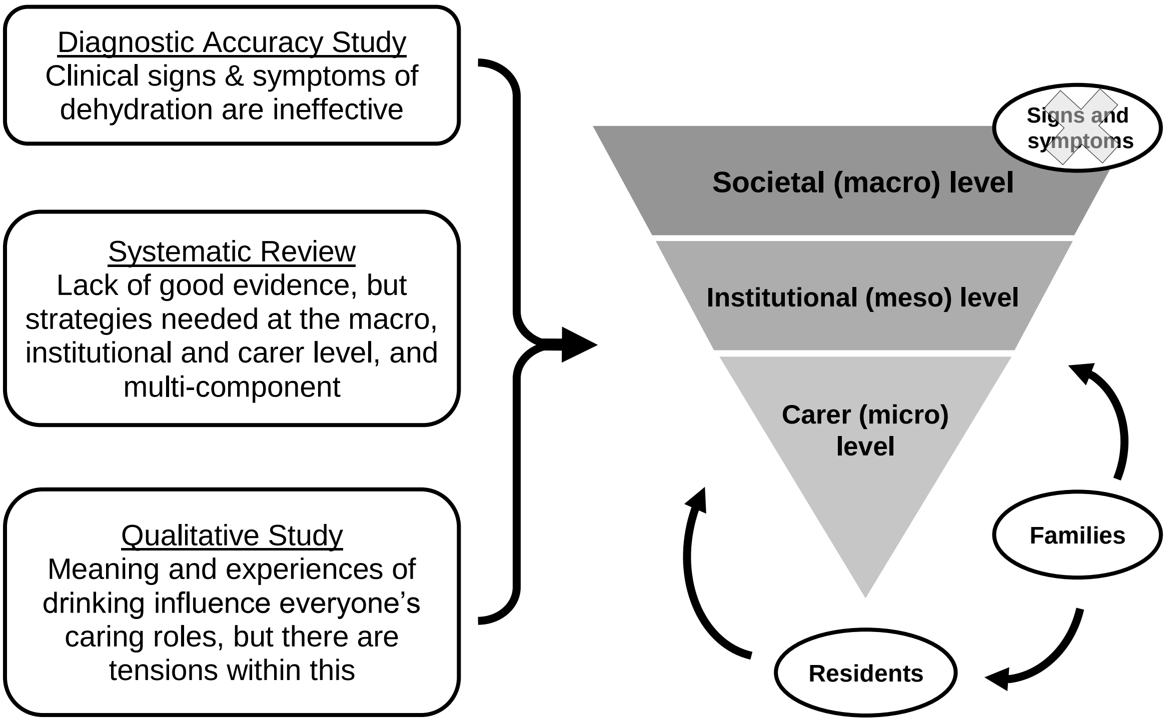
The meta-inference from the three component studies is that hydration care takes place at the macro, meso and micro level. This involves national policies and guidelines, institutional practices, and care at the carer, resident and family levels. Crucially, the relationships between all these stakeholders impact both positively and negatively on the way in which residents are supported to drink (Figure 7-2).

The qualitative study provided unique insights, chiefly residents' contributions to their own care, family involvement in their relatives' care and the way in which care is viewed negatively by external agencies. Residents and their families are not passive recipients or observers of hydration care, they take on active roles, and by recognising this as a positive contribution, and exploring additional ways in which these contributions could support residents to drink well is likely to be beneficial for residents. The impact of reducing negative external criticisms in supporting residents to drink well is more complex and difficult to predict, although it could be argued that if the challenges faced by care staff were more widely known, and that effective care is the result of a multiplicity of factors at different levels (societal, institutional, carer, resident and family), then staff would encounter fewer criticisms and greater support when dealing with external agencies, which may have a subsequent benefit for residents in their care.

In the systematic review the researcher-led studies tended not to acknowledge the inter-relationships between residents, carers and families or many of the tensions and barriers experienced by them. However, the systematic review studies were able to identify the way in which macro factors could impact on hydration care and an individual resident's dehydration risk. Whether they do or not requires further investigation, but the salient point here is that these issues have been identified as being possible influencing factors. The findings of the diagnostic accuracy, when disseminated, may inform practice at a national guideline level.

A further issue highlighted in the integration was the way in which included studies in the systematic review which investigated single components of drinking were likely to be too simplistic, as they did not recognise the multiplicity and interplay of factors required to support residents' drinking.

Figure 7-2: Integration of findings



Few studies have used mixed methods when investigating hydration care for older people in care homes. In a quantitative study to implement a hydration management programme in US care homes, Mentes included a qualitative component by interviewing staff to explore the facilitators and barriers to the implementation of the programme[178]. Other studies which have used mixed methods have mixed different qualitative methods, rather than qualitative and quantitative methods, as described in section 2.12.

7.4.3.1 Limitations

A potential limitation in a mixed methods study is the possible limitation in scope of each of the component studies because of the timescale and the need to ensure that each component study is completed, recognising that only when they are complete can their findings be integrated. Although the endpoint for some studies can be arbitrary, due to limiting factors of time or resources, endpoints can also be a considered decision depending on whether the research question has been fully addressed. Regarding the three component studies in this thesis, the diagnostic accuracy study recruited to target, and achieved what it was designed to do namely assess the diagnostic utility of clinical signs and symptoms of dehydration, so it was a complete study. It could have been extended further by exploring the most appropriate way of disseminating the study's findings to change perceptions and practice, but this may well form the basis of a future study. The systematic review was an extensive review of interventional and observational studies, which was completed and the findings published. Had time allowed, this review could have been extended into a mixed methods review where qualitative studies could have been included as well, with the potential for additional findings to have emerged. The third study in this thesis, the qualitative study, could easily have developed into a single study for this thesis, whereby further focus groups with each participant type would have confirmed whether saturation point had been reached, and additional focus groups with other stakeholders would have provided additional insights from different viewpoints, whilst one-to-one interviews with some participants to explore some issues in greater depth may have provided some insights into those areas not addressed in depth in this study, and observational data would have provided a further viewpoint. The qualitative study was perhaps unduly curtailed by its time constraints, but such limits also ensured that the data collected could be analysed and the findings integrated with those of the other component studies to address the research question.

7.4.3.2 Strengths

The strengths of this mixed methods study relate to its focus, its design and the designs and conduct of the component studies, and the manner in which the findings relate directly to care.

The focus of this mixed methods study was to recognise, understand and prevent water-loss dehydration in older people (aged ≥65 years) living in residential care, appreciating that hydration care for this group of people living in these settings was distinct. Throughout this thesis I have maintained this focus, except in some sections of the qualitative study (Chapter 6) where I found that I had to move beyond these boundaries to find research in other areas which resonated with my novel findings, because some of my findings had not previously been reported in the field of hydration care for older care home residents specifically.

In Chapter 1, I identified that research into hydration care is emerging and thus this thesis will contribute substantially to this body of knowledge, not only because each of the component studies on their own have provided novel findings, but the synthesis of the integrated findings has also provided novel insights to obtain a more complete understanding of hydration care for older people living in care homes.

Mixed methods research is itself an emerging methodology in health research, combining qualitative and quantitative approaches, which frequently results in 'superior' research because it can answer complex research questions which either a quantitative or qualitative approach on their own would struggle to address[282]. The central premise behind mixed methods research is that the combined, integrated findings provide a greater understanding than the individual studies alone[20,283]. The different types of studies and the possible combinations of studies which can be brought together under the umbrella of 'mixed methods research' is numerous. In this thesis, I have included three very different studies methodologically: a qualitative study using focus groups, a diagnostic accuracy study and a systematic review. I have not been able to find any other health-related mixed methods research studies which have included these three study designs, and thus the way in which the findings from the component studies have been integrated and the resultant synthesis is probably unique, resulting in increased understanding of hydration care in older people living in care homes particularly, but also the methodology could be used as a template more widely in healthcare.

A strength of this mixed methods study was the way in which each component study was selected to address the research question, using appropriate methodologies, the rigorous conduct employed to conduct each component study within a recognised mixed methods design with a true integration of the findings which were systematically related to each other rather than simply standing alongside each other, as recommended by both Bryman and Creswell[20,284].

This research has also benefitted from the unique insights provided by the residents and care staff who were members of the Advisory Groups. The Advisory Groups were set up to advise on the DRIE study specifically, but it soon became clear that I would benefit if I asked for advice about the systematic review and qualitative studies, as long as members were happy to extend their remit, which they were. Our Advisory Group members provided frank and honest advice on all three studies, and they were particularly helpful when we were experiencing recruitment difficulties for the DRIE study, and when I was planning the qualitative study, to think about what kinds of support I needed to provide to enable residents and care staff to take part, as well as suggesting additional topics for the discussions.

This research has been underpinned by my commitment to ensure that findings should, if possible, have a practical application to care, aiming to improve care for older residents living in care homes. I looked at how hydration care was regulated to ensure that this mixed methods study and each of the component studies could address key areas of the

CQC regulations, and I involved the Advisory Group members to provide further insights into the applicability of the findings. I have been proactive in disseminating the findings as widely as possible, for academic and lay audiences. I have listed my academic publications at the end of each chapter, I have also become involved with an NHS England initiative focussing on dehydration prevention and dissemination to lay audiences has included my contributions to the DRIE Newsletters and website, presentations at UEA showcase events for the public and training sessions for care staff.

7.4.3.3 Challenges and reflections

There have been a number of challenges encountered in this study of both a theoretical and practical nature. From a theoretical perspective, our understanding of the underlying physiology of dehydration in older people is a developing area of research and may account for the differences in terminology found in the literature[6]. From a practical viewpoint, there were issues around recruitment in the diagnostic accuracy study, which we addressed by reviewing our procedures and involving our Steering Group and Advisory Groups to guide us. When interviewing residents, we found that the length of the interview was tiring for some, and some residents declined to participate in some of the examinations.

Conducting research in care homes has been widely acknowledged as challenging for recruitment and retention, but also with respect to communications[195,285]. In both the diagnostic accuracy and qualitative studies we found that not all staff were as fully aware and supportive of our research as their managers, and that the success of the research involved ongoing discussions with staff. Thus, it has been reassuring when we have heard from care homes subsequently, that many viewed their research involvement positively, and also that this view was shared by the CQC, as this quote from one inspection report described:

> *"The manager spoke about how the home was involved with projects in conjunction with the University of East Anglia. At the time of inspection, they were involved in a project about dehydration and its effects in older people. Learning from the projects was applied to the care and treatment of people living at this home."* *Care Home 052, June 2012*

7.4.4 Recommendations for care and future research

Several findings which have emerged from this study can underpin recommendations for supporting residents' drinking, which could be easily implemented immediately, whilst other findings indicate that a more rigorous research approach should be undertaken to assess whether more substantial changes would provide the support required to help resident's drink and prevent dehydration. These will be discussed in the next two sections.

7.4.4.1 Suggestions for changes to current care practices

1. Information for care homes which suggest a range of reasons and occasions when residents may like to drink could assist staff with residents who are reluctant to drink. Facilities for visitors to make drinks, so that residents feel able to offer drinks as a form of hospitality, is just one suggestion (sections 6.5.3.1, 6.5.3.6).
2. Residents described how they tended to wait for drinks rounds and not ask for drinks between-times, as well as waiting for staff to offer help. Thus, care homes could support residents to drink by ensuring staff are proactive with offers of help and ensuring that established drinks routines take place when they are expected to (section 6.5.3.7.1).
3. Raising awareness about the difficulties some residents have with holding and drinking from some cups and glasses (section 6.5.3.7.4), and particularly if drinks are served in squashable disposable plastic cups (section 6.5.3.7.4).
4. Increasing awareness for care staff about the way in which residents take an active role in ensuring they drink sufficiently, that many residents wish to be involved and the ways residents adapt if they dislike drinks which are being offered, including refusing drinks they dislike (section 6.5.4.2).
5. Increasing awareness for care staff about the way in which some families would like to take an active role in supporting their relative to drink and families' need for communication about their relative's daily care (6.5.4.3).
6. Raising staff awareness about residents' negative views about water jugs which contain lukewarm water, suggesting that the water is changed more regularly (section 6.5.3.4).

7.4.4.2 Recommendations for future research

1. Training for care staff in hydration care. Greater understanding is needed about what kinds of training take place currently, who receives the training and whether staff training is effective in supporting residents to drink (sections 5.4.3.6, 6.5.3, 6.5.4).

2. The way in which care staff currently draw on their own personal experiences and those of their colleagues to inform care should be evaluated to assess how this may benefit and/or be detrimental to supporting residents in their care to drink (sections 6.5.4.5, 6.5.4.5.2).
3. Residents described listening to advice and changing their drinking habits accordingly, so research investigating different ways on how to provide advice and information to residents is likely to benefit residents (sections 5.4.3.9, 6.5.3, 6.5.4).
4. An exploration of the ways in which care home systems can be developed to encompass residents' choices of what, when and how drinks are served (sections 5.4.3, 6.5.3).
5. Exploring ways of empowering residents to feel able to speak out about how they would prefer their drinks to be served, and whether this would be beneficial, compared to current strategies of residents quietly adapting or preferring not to drink (section 6.5.3).
6. The way in which drinking aids are used to assist residents to drink should be explored further. How and when drinking aids are selected for residents, whether residents are involved in the decision-making, how a resident's needs for them are assessed, how they are introduced to residents and their families and whether using drinking aids are felt to be stigmatising, either for the resident and/or the home (section 6.5.3.7.5).
7. The way in which anxieties about continence and/or getting to a toilet on time may have a detrimental effect on drinking and dehydration requires further exploration to examine whether this impacts on drinking at all, just at particular times of day, or throughout the day (section 5.4.3.10).
8. The way in which the social and physical environment impacts on drinking also needs further exploration, particularly from residents' perspectives (sections 5.4.3.3, 6.5.3.9).
9. Further exploration about family/staff relationships and how to develop ways of involving families in their relative's care to support drinking is likely to be beneficial for residents as well as staff (section 6.5.4.3).
10. The way in which the findings from the diagnostic accuracy should be disseminated and implemented to change practice should be investigated (sections 4.10, 6.5.4.4.8).

11. Further investigations are required to provide care home staff with the means of identifying dehydration and inadequate fluid intake more accurately (sections 5.5, 6.5.4.4.6).
12. Further exploration is required about the ways in which care home guidelines, systems and cultures guide staff in supporting residents to drink and the ways in which staff are supported to prioritise conflicting priorities between different aspects of care needs (section 6.5.4.5.3).
13. Further exploration is needed of the issues identified in the qualitative study which were not discussed in detail, to establish whether they were not important, of a sensitive nature or simply omissions (section 6.6.3).
14. The use of deception in relation to supporting residents to drink should be included in wider ethical discussions about the use of deception when caring for people with dementia (section 6.5.4.5.5).
15. Interventions are required to identify and target personal barriers to drinking, at the resident level, thus promoting person-centred care (section 6.6).
16. It is likely that supporting residents to drink requires multi-component studies, rather than those investigating a single component, but this needs further investigation (sections 5.5, 7.4.3).
17. Further investigations to assess effectiveness of interventions or associations to promote drinking and/or prevent dehydration should be well-designed, adequately powered and use valid outcome measures (sections 4.8, 5.5).
18. Further investigations are required to investigate if, and if so, how, macro factors impact on how individual residents are supported to drink and their dehydration risk (sections 5.4.3.4, 5.4.3.4, 5.4.3.6, 5.4.3.7, 5.4.3.8, 6.5.4.4).
19. Robust cohort studies investigating the effects of national policies and guidelines on dehydration risk for residents living in UK care homes are required (section 5.5).
20. Implementing changes to care home systems and cultures to support residents to drink well and prevent dehydration may require further exploratory research to understand differences in care home cultures, in order to understand the most appropriate approach to address change and then whether these changes have a positive impact on residents' drinking and preventing dehydration (section 6.5.4.6).

7.5 Publications arising from Chapter 7

I was lead author on an abstract selected for an oral presentation for a symposium on dehydration prevention in care homes. This presentation combined the findings of the systematic review and qualitative studies. For this abstract, I collected and analysed the data for both studies.

- Bunn DK, Hooper L, Poland F. Thinking about Drinking: Identifying drivers and barriers to hydration in older care home residents. Symposium talk presented at the Gerontological Society of America annual meeting, Orlando, USA. The Gerontologist. 2015. 55(suppl 2):594.

I was lead author on an abstract selected for oral presentation at the UEA Faculty of Health postgraduate conference.

- Bunn, DK. 'When the whole is greater than the sum of its parts.' Investigating hydration care in older care home residents: a mixed methods study. 2016.

I presented the methods and findings from the component studies prior to presenting the methods and integrated findings from the mixed methods study.

7.6 Conclusions of this thesis

This thesis has addressed the research question:

> *"How can we understand, recognise and prevent dehydration in older residents living in care homes?"*

By adopting a mixed methods research design, undertaking three component studies, analysing the findings and drawing conclusions, then integrating them to provide a meta-inference, I have provided further breadth and depth, strengthening the findings from each individual study to provide a foundation on which to develop future prevention strategies.

There are multiple factors involved in supporting residents to drink well and preventing dehydration. Care is required at multiple levels: macro (societal), institutional (meso) and carer (micro), but effective care also means working with residents and their families to involve those who wish to be actively involved. Relationships between each level (macro, meso, micro) of care provider, residents and families impact on residents' drinking, both positively and negatively, so prevention needs to acknowledge this relational care and develop the positive aspects whilst at the same time working to minimise the detrimental aspects, so that residents will benefit.

Research into hydration care in care homes is an emerging area of research, driven by increasing concerns about dehydration prevalence, and this thesis has expanded our understanding of how we can recognise and prevent dehydration in this group of people, recognising that whilst fluid intake is a physiological necessity to prevent dehydration, drinking for care home residents is a social experience involving multi-levels of care.

List of Abbreviations

Abbreviation	**Explanation**
ACE	Angiotensin-converting enzyme
ADH	Anti-diuretic hormone
AUC	Area under the curve
BIA	Bioelectrical impedance analysis
BMI	Body mass index
BP	Blood pressure
Bpm	Beats per minute
BUN	Blood urea nitrogen
CCT	Controlled clinical trial
CH	Care home
CHD	Coronary heart disease
CI	Confidence interval
CINAHL	Cumulative Index to Nursing and Allied Health Literature
cms	Centimetres
CNA	Certified Nursing Assistant
Co-F	Co-facilitator
COREQ	Consolidated criteria for reporting qualitative studies
CPS	Cognitive Performance Scale
CQC	Care Quality Commission
CVg	Interindividual variation
CVi	Intraindividual variation
DA	Diagnostic Accuracy
DB	Diane Bunn
DBP	Diastolic blood pressure
DOR	Diagnostic odds ratio
DRIE	Dehydration Recognition in our Elders
ECF	Extracellular fluid
ECW	Extracellular water
Embase	Excerpta Medica database
EFSA	European Food Standard Agency
e.g.	Exempli gratia (‘for example’)
ENRICH	Enabling Research in Care Homes
ery/L	Erythrocytes/microlitre
Euroqol 5D-3L	Euroqol 5 Dimension - 3 level
FI	Faecal incontinence
FIM	Functional Independence Measure
Fl oz	Fluid ounces
FN	False negative
FP	Fiona Poland (secondary supervisor)
FP (Table)	False positive
g/L	Grams per litre
GP	General Practitioner
Hb	Haemoglobin

HLE	Hydration linked events
hr	Hour
HRD	Hours per resident per day
ICC	Intraclass correlation coefficient
ICD	International Classification of Diseases
ICF	International Classification of Functioning, Disability and Health
ICW	Intracellular water
IOM	Institute of Medicine
IQR	Interquartile range
IV	Intravenous
K^+	Potassium
kg	Kilogram
kHz	KiloHertz
L/day	Litres per day
Leu/µL	Leucocytes per microlitre
LH	Lee Hooper (Primary Supervisor)
LPN	Licenced Practical Nurse
LR	Likelihood ratio
LTCF	Long-term care facility
m	metre
MDS	Minimum Data Set
meq/l	milliequivalents per litre
mg/dl	Milligram/decilitre
MJ1c	RAI-MDS code for dehydration
mls	Millilitres
mmHg	Millimetre of mercury
Mmol	Millimole
MMSE	Mini Mental State Examination
mOsm	Milliosmole
MUST	Malnutrition Universal Screening Tool
n	Number of participants
N/A	Not applicable
N/R	Not reported
Na^+	Sodium
Neg	Negative
NH	Nursing Homes
NHANES	National Health and Nutrition Examination Survey
NIHR	National Institute of Health Research
No.	Number
NOS	Newcastle-Ottawa Scale
NPV	Negative predictive value
NREC	National Research Ethics Committee
NRES	National Research Ethics Service
ns	Not significant
^oC	Degrees centigrade
ONS	Oral nutritional supplement

OR	Odds ratio
OSCAR	Online Survey, Certification and Reporting
oz	Ounce
PEG	Percutaneous endoscopic gastrostomy
PICOS	Participants, interventions, comparator, outcome, study design
PIS	Participant Information Sheet
PP	Pulse pressure
PPIRes	Public and Patient Involvement in Research
PPV	Positive predictive value
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO	International prospective register of systematic reviews National Institute for Health Research
RAI	Resident Assessment Instrument
RC/AL	Residential/assisted living facilities
RCT	Randomised Controlled Trial
RCTc	Randomised Controlled Crossover Trial
RIP	"Rest in peace" (denotes death)
RN	Registered Nurse
ROC	Receiver operating curve
RR	Relative risk
secs	Seconds
SBP	Systolic blood pressure
SD	Standard deviation
Sl	Slight
SOPs	Standard operating procedures
sOsm	Serum osmolality
SPMSQ	Short Portable Mental Status Questionnaire
SPSS	Statistical Package for the Social Sciences
SR	Systematic Review
SST	Serum separation tubes
STARD	Standards for Reporting of Diagnostic Accuracy
TBR	Total body resistance
TBW	Total body water
TN	True negative
TP	True positive
UEA	University of East Anglia
UI	Urinary incontinence
UK	United Kingdom
URTI	Upper respiratory tract infection
US	United States of America
USG	Urine specific gravity
UTI	Urinary tract infection
v or vs	Versus
WHO	World Health Organization

Reference List

1. Thomas DR, Cote TR, Lawhorne L, et al. Understanding Clinical Dehydration and Its Treatment. *J Am Med Dir Assoc*. 2008;9(5):292–301.

2. Oxford University Press. Oxford Dictionaries. 2015. Available at: http://www.oxforddictionaries.com/definition/english/treat. Accessed August 13, 2015.

3. Crotty P. The value of qualitative research in nutrition. *Annu Rev Heal Soc Sci*. 1993;3(1):109–118.

4. El-sharkawy AM, Sahota O, Maughan RJ, Lobo DN. The pathophysiology of fluid and electrolyte balance in the older adult surgical patient. *Clin Nutr*. 2014;33(1):6–13. doi:10.1016/j.clnu.2013.11.010.

5. Faes MC, Spigt MG, Olde Rikkert MGM. Dehydration in Geriatrics. *Geriatr Aging*. 2007;10(9):590–596.

6. Cheuvront SN, Kenefick RW. Dehydration: Physiology, Assessment, and Performance Effects. *Compr Physiol*. 2014;4(January):257–285.

7. Maughan RJ. Hydration, morbidity, and mortality in vulnerable populations. *Nutr Rev*. 2012;70 Suppl 2:S152–5. doi:10.1111/j.1753-4887.2012.00531.x.

8. Gaspar P. Comparison of four standards for determining adequate water intake of nursing home residents. *Res Theory Nurs Pract*. 2011;25(1):11–22.

9. Xiao H, Barber J, Campbell E. Economic burden of dehydration among hospitalized elderly patients. *Am J Heal Syst Pharm*. 2004;61:2534–2541.

10. World Health Organization. *Towards a Common Language for Functioning, Disability and Health*. Geneva; 2002. doi:WHO/EIP/GPE/CAS/01.3.

11. O’Neill PA, Faragher EB, Davies I, Wears R, McLean KA, Fairweather DS. Reduced survival with increasing plasma osmolality in elderly continuing-care patients. *Age Ageing*. 1990;19(1):68–71.

12. Maslow A. A theory of human motivation. *Psychol Rev*. 1943;50(4):370–396. doi:10.1037/h0054346.

13. 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. Accessed October 15, 2015.

14. Wolff A, Stuckler D, McKee M. Are patients admitted to hospitals from care homes dehydrated? A retrospective analysis of hypernatraemia and in-hospital mortality. *J R Soc Med*. 2015;0(0):1–7. doi:10.1177/0141076814566260.

15. Martin D. Scandal of dehydrated pensioners rushed to hospital because their care homes did not give them a drink. *Dly Mail*. 2013. Available at: http://www.dailymail.co.uk/news/article-2260838/Scandal-dehydrated-elderly-rushed-hospital-care-homes-did-drink.html. Accessed October 15, 2015.

16. Unknown. Warrington care home residents “at risk of dehydration.” *BBC News*. 2015. Available at: http://www.bbc.co.uk/news/uk-england-merseyside-34347652. Accessed October 15, 2015.

17. Nursing & Midwifery Council (NMC). *The code: professional standards of practice and behaviour for nurses and midwives*. London: NMC; 2015.

18. Ribeiro S, Morley JE. Dehydration is Difficult to Detect and Prevent in Nursing Homes. *J Am Med Dir Assoc*. 2015;16:175–6.

19. Higgins J, Green S. *Cochrane Handbook for Systematic Reviews of Interventions*. (Higgins JPT, Green S, eds.). Chichester: John Wiley & Sons; 2008. Available at: www.cochrane-handbook.org.

20. Creswell J. *A Concise Introduction to Mixed Methods Research*. London: Sage Publications; 2015.

21. Creswell J. Chapter 2, p16. In: *A Concise Introduction to Mixed Methods Research*. London: Sage Publications; 2015.

22. Mason J. Mixing methods in a qualitatively driven way. *Qual Res*. 2006;6(1):9–25. doi:10.1177/1468794106058866.

23. Popkin BM, D’Anci KE, Rosenberg IH. Water, Hydration and Health. *Nutr Rev*. 2010;68(8):439–458.

24. Benelam B, Wyness L. Hydration and Health: A Review. *Nutr Bull*. 2010;35:3–25.

25. Visser M, Gallagher D. Age-related change in body water and hydration in old age. In: Arnaud MJ, ed. *Hydration throughout life: International Conference, Vittel, France, June 9-12, 1998*. Vittel, France: John Libby Eurotext; 1998:117–125.

26. Vivanti A, Yu L, Palmer M, Dakin L, Sun J, Campbell K. Short-term body weight fluctuations in older well-hydrated hospitalised patients. *J Hum Nutr Diet*. 2013;26(5):429–35. doi:10.1111/jhn.12034.

27. Begum MN, Johnson CS. A review of the literature on dehydrationin the institutinalized elderly. *Clin Nutr ESPEN*. 2010;5:e47–e53.

28. Agostoni C, Bresson J, Fairweather-Tait S. Scientific opinion on dietary reference values for water. *EFSA J*. 2010;8(3):1–48. doi:10.2903/j.efsa.2010.1459.

29. Armstrong L. Assessing Hydration Status: The elusive gold standard. *J Am Coll Nutr*. 2007;26(5):575s–584s.

30. Institute of Medicine Panel on Dietary Reference Intakes for Electrolytes and Water. *Dietary Reference Intakes for water, potassium, sodium, chloride and sulfate*. Washington DC: The National Academies Press; 2005.

31. Cheuvront SN, Kenefick RW, Charkoudian N, Sawka MN. Physiologic basis for understanding quantitative dehydration. *Am J Clin Nutr*. 2013;97:455–62. doi:10.3945/ajcn.112.044172.Am.

32. Leiper JB, Primrose CS, Primrose WR, Phillimore J, Maughan RJ. A Comparison of water turnover in older people in community and institutional settings. *J Nutr Heal Aging*. 2005;9(3):189–193.

33. Weinberg AD, Minaker KL, Allen JR, et al. Dehydration: Evaluation and Management in Older Adults. *JAMA*. 1995;274(19):1552–1556.

34. Grandjean AC, Reimers KJ, Buyckx ME. Hydration: issues for the 21st century. *Nutr Rev*. 2003;61(8):261–271.

35. Miller M. Water metabolism in the elderly in health and disease: Aging changes affecting risk for hypernatraemia and hyponatraemia. In: Vellas B, Albarede JL, Garry PJ, eds. *Hydration and Aging*. Paris: Serdi; 1998:59–82.

36. Sheehy C, Perry PA, Cromwell SL. Dehydration: biological considerations, age-related changes, and risk factors in older adults. *Biol Res Nurs*. 1999;1(1):30–37.

37. Beck LH. Fluid and electroylyte balance in the elderly. *Geriatr Nephrol Urol*. 1999;9(1):11–14.

38. Kavouras SA, Anastasiou CA. Water physiology: essentiality, metabolism, and health implications. *Nutr Today*. 2010;45(6S):S27–S32.

39. Naitoh M, Burrell M. Thirst in Elderly Subjects. In: Vellas B, Albarede J, Garry PJ, eds. *Hydration and Aging*. Paris: Serdi; 1998:33–46.

40. Kenney WL, Chiu P. Influence of age on thirst and fluid intake. *Med Sci Sport Exerc*. 2001;33(9):1524–1532.

41. Horani MH, Morley JE. Pathophysiology of hypodipsia in the elderly. In: Vellas B, Albarede JL, Garry PJ, eds. *Hydration and Aging*. Paris: Serdi; 1998:119–132.

42. Kositzke JA. A question of balance: dehydration in the elderly. *J Gerontol Nurs*. 1990;16(5):4–.

43. Lancaster KJ, Smiciklas-Wright H, Heller DA, Ahern FM, Jensen G, Smiciklast-Wright H. Dehydration in black and white older adults using diuretics. *Ann Epidemiol*. 2003;13(7):525–529. doi:10.1016/S1047-2797(03)00004-8.

44. Stookey J. High prevalence of plasma hypertonicity among community-dwelling older adults: results from NHANES III. *J Am Diet Assoc*. 2005;105(8):1231–1239.

45. Warren JL, Bacon WE, Harris T, McBean AM, Foley DJ, Phillips C. The burden and outcomes associated with dehydration among US elderly, 1991. *Am J Public Heal*. 1994;84(8):1265–1269.

46. Stookey J, Pieper CF, Cohen HJ. Is the prevalence of dehydration among community-dwelling older adults really low? Informing current debate over the fluid recommendation for adults aged 70+years. *Public Heal Nutr*. 2005;8(8):1275–1285.

47. Hooper L, Bunn DK, Downing A, et al. Which frail older people are dehydrated? The UK DRIE study. *J Gerontol A Biol Sci Med Sci*. 2015;Advance Ac:1–7. doi:10.1093/gerona/glv205.

48. Albert S, Nakra B, Grossberg G, Caminal E. Vasopressin response to dehydration in Alzheimer’s disease. *J Am Geriatr Soc*. 1989;37:843.

49. Dyck MJ. Nursing staffing and resident outcomes in nursing homes. *Dr Diss*. 2004.

50. Josseran L, Caillère N, Brun-Ney D, et al. Syndromic surveillance and heat wave morbidity: a pilot study based on emergency departments in France. *BMC Med Inform Decis Mak*. 2009;9:14. doi:10.1186/1472-6947-9-14.

51. Hooper L, Bunn D. Detecting dehydration in older people: useful tests. *Nurs Times*. 2015;111(32/33):12–16.

52. Gaspar P. Water Intake of Nursing Home Residents. *J Gerontol Nurs*. 1999;25(4):22–29.

53. Chidester JC, Spangler AA. Fluid intake in the institutionalized elderly [corrected] [published erratum appears in J AM DIET ASSOC 1997 Jun; 97(6): 584]. *J Am Diet Assoc*. 1997;97(1):23–30.

54. Armstrong-Esther CA, Browne KD, Armstrong-Esther DC, Sander L. The institutionalized elderly: dry to the bone! *Int J Nurs Stud*. 1996;33(6):619–28.

55. Whelan K. Inadequate fluid intakes in dysphagic acute stroke. *Clin Nutr*. 2001;20:423–428. doi:10.1054/clnu.2001.0467.

56. Royal College of Nursing. Water for Health: Hydration Best Practice Toolkit for Hospitals and Healthcare. 2007:-. Available at: http://www.rcn.org.uk/__data/assets/pdf_file/0003/70374/Hydration_Toolkit_-_Entire_and_In_Order.pdf. Accessed October 15, 2015.

57. Sécher M, Ritz P. Hydration and cognitive performance. *J Nutr Heal Aging*. 2012;16(4):325–9.

58. Arnaud MJ. Mild dehydration: a risk factor for constipation? *Eur J Clin Nutr*. 2003;57(suppl2):s88–s95.

59. Robinson SB. Can a beverage cart help improve dehydration? *Geriatr Nurs*. 2002;23(4):208–211.

60. Schnelle JF, Leung FW, Rao SSC, et al. A controlled trial of an intervention to improve urinary and fecal incontinence and constipation. *J Am Geriatr Soc*. 2010;58(8):1504–11. doi:10.1111/j.1532-5415.2010.02978.x.

61. Ueki A, Otsuka M. Life style risks of Parkinson’s disease: Association between decreased water intake and constipation. *J Neurol*. 2004;251(SUPPL. 7):18–23. doi:10.1007/s00415-004-1706-3.

62. Leurs LJ, Schouten LJ, Goldbohm RA, van den Brandt PA. Total fluid and specific beverage intake and mortality due to IHD and stroke in the Netherlands Cohort Study. *Br J Nutr*. 2010;104(8):1212–1221.

63. Chan J, Knutsen SF, Blix GG, Lee JW, Fraser GE. Water, other fluids, and fatal coronary heart disease: the Adventist Health Study. *Am J Epidemiol*. 2002;155(9):827–33.

64. Stookey J, Purser JL, Pieper CF, Cohen HJ. Plasma hypertonicity: another marker of frailty? *J Am Geriatr Soc*. 2004;52(8):1313–20. doi:10.1111/j.1532-5415.2004.52361.x.

65. Stotts NA, Hopf HW. The link between tissue oxygen and hydration in nursing home residents with pressure ulcers: Preliminary data. *J Wound, Ostomy Cont Nurs*. 2003;30(4):184–90. doi:10.1067/mjw.2003.132.

66. Bhalla A, Sankaralingam S, Dundas R, Swaminathan R, Wolfe CD, Rudd AG. Influence of raised plasma osmolality on clinical outcome after acute stroke. *Stroke*. 2000;31(9):2043–2048.

67. Manz F. Hydration and disease. *J Am Coll Nutr*. 2007;26(Suppl 5):535S–541S.

68. Lin S. Fluid intake and bacteriuria in nursing home residents in southern Taiwan. *Nurs Res*. 2013;62(1):66–72. doi:10.1097/NNR.0b013e31826901d5.

69. Taylor E, Stampfer M, Curhan G. Dietary Factors and the Risk of Incident Kidney Stones in Men: New Insights after 14 Years of Follow-up. *J Am Soc Nephrol*. 2004;15(12):3225–3232.

70. Kelly J, Hunt BJ, Lewis RR, Swaminathan R, Moody A, Seed PT. Dehydration and venous thromboembolism after acute stroke. *QJM*. 2004;97(5):293–296. doi:10.1093/qjmed/hch050.

71. Kalhoff H. Mild dehydration: a risk factor of broncho-pulmonary disorders? *Eur J Clin Nutr*. 2003;57(suppl 2):S81–s87. doi:10.1038/sj.ejcn.1601907.

72. Altieri A, La Vecchia C, Negri E. Fluid intake and risk of bladder and other cancers. *Eur J Clin Nutr*. 2003;57(suppl 2):S59–S68. doi:10.1038/sj.ejcn.1601903.

73. Smith A, Shaw L. Mild dehydration: a risk factor for dental disease? *Eur J Clin Nutr*. 2003;57:S75–s80. doi:10.1038/sj.ejcn.1601907.

74. Natalwala A, Potluri R, Uppal H, Heun R. Reasons for hospital admissions in dementia patients in Birmingham, UK, during 2002-2007. *Dement Geriatr Cogn Disord*. 2008;26:499–505.

75. Himmelstein DU, Jones AA, Woolhandler S. Hypernatremic dehydration in nursing home patients: an indicator of neglect. *J Am Geriatr Soc*. 1983;31(8):466–71.

76. El-Sharkawy A, Watson P, Neal K, et al. Hydration and outcome in older patients admitted to hospital (The HOOP prospective cohort study). *Age Ageing*. 2015;0:1–5. doi:10.1093/ageing/afv119.

77. Chassagne P, Druesne L, Capet C, Ménard JF, Bercoff E. Clinical presentation of hypernatremia in elderly patients: a case control study. *J Am Geriatr Soc*. 2006;54(8):1225–30. doi:10.1111/j.1532-5415.2006.00807.x.

78. Bourdel-Marchasson I, Proux S, Dehail P, et al. One-year incidence of hyperosmolar states and prognosis in a geriatric acute care unit. *Gerontology*. 2004;50(3):171–176. doi:10.1159/000076775.

79. Warner J. Clinicians’ guide to evaluating diagnostic and screening tests in psychiatry. *Adv Psychiatr Treat*. 2004;10(6):446–454. doi:10.1192/apt.10.6.446.

80. Armstrong L, Johnson EC, Munoz CX, et al. Hydration biomarkers and dietary fluid consumption of women. *J Acad Nutr Diet*. 2012;112(7):1056–61. doi:10.1016/j.jand.2012.03.036.

81. Baron S, Courbebaisse M, Lepicard EM, Friedlander G. Assessment of hydration status in a large population. *Br J Nutr*. 2015;113(1):147–158. doi:10.1017/S0007114514003213.

82. Toto KH. Regulation of plasma osmolality: thirst and vasopressin. *Crit Care Nurs Clin North Am*. 1994;6(4):661–674.

83. Cheuvront S, Kenefick RW, Charkoudian N, Sawka M. Reply to LE Armstrong et al. *Am J Clin Nutr*. 2013;98(2):505–6.

84. Armstrong L, Maughan RJ, Senay L, Shirreffs S. Limitations to the use of plasma osmolality as a hydration marker. *Am J Clin Nutr*. 2013;98(2):503–504.

85. Khajuria a., Krahn J. Osmolality revisited - Deriving and validating the best formula for calculated osmolality. *Clin Biochem*. 2005;38:514–519. doi:10.1016/j.clinbiochem.2005.03.001.

86. Siervo M, Bunn DK, Prado C, Hooper L. Accuracy of prediction equations for serum osmolarity in frail older people with and without diabetes. *Am J Clin Nutr*. 2014;100:867–76. doi:doi:10.3945/ajcn.114.086769.

87. Hooper L, Bunn DK, Jimoh F, Fairweather-Tait SJ. Water-loss dehydration and aging. *Mech Ageing Dev*. 2014;136-137:50–8. doi:10.1016/j.mad.2013.11.009.

88. American Medical Directors Association (AMDA). *Guideline Summary NGC-7636, Dehydration and fluid maintainance in the long-term care setting*. Columbia; 2009.

89. Dougherty L, Lister S, eds. *The Royal Marsden Hospital Manual of Clinical Nursing Procedures*. 8th ed. Oxford: Wiley-Blackwell; 2011.

90. Docherty B. Physical assessment of hydration. *Nurs Times*. 2008;104(24):9.

91. Hodgkinson B, Evans D, Wood J. Maintaining oral hydration in older adults: a systematic review. *Int J Clin Pr*. 2003;9:S19–S28.

92. Shepherd A. Water, water, everywhere and not a drop to drink? *Nurs Resid Care*. 2013;15(8):530–537.

93. Mentes J, Kang S. *Hydration Management Evidence-based Protocol*. (Schoenfelder DP, ed.). Iowa City: The University of Iowa College of Nursing; 2011.

94. NHS Choices. Dehydration - symptoms. Available at: http://www.nhs.uk/Conditions/Dehydration/Pages/Symptoms.aspx. Accessed October 15, 2015.

95. McGee S, Abernethy WB, Simel DL. Is this patient hypovolemic? *JAMA*. 1999;281(11):1022–1029.

96. Mentes J, Wakefield B, Culp K. Use of a Urine Colour Chart to Monitor Hydration Status in Nursing Home Residents. *Biol Res Nurs*. 2006;7(3):197–203.

97. Hooper L, Attreed NJ, Campbell WW, et al. Clinical and physical signs for identification of impending and current water-loss dehydration in older people. *Cochrane Database Sytematic Rev*. 2015;(4):Art. No.: CD009647. doi:10.1002/14651858.CD009647.

98. Fortes MB, Owen J a., Raymond-Barker P, et al. Is This Elderly Patient Dehydrated? Diagnostic Accuracy of Hydration Assessment Using Physical Signs, Urine, and Saliva Markers. *J Am Med Dir Assoc*. 2015;16:221–228. doi:10.1016/j.jamda.2014.09.012.

99. Shimizu M, Kinoshita K, Hattori K, et al. Physical signs of dehydration in the elderly. *Intern Med*. 2012;51(3):1207–1210. doi:10.2169/internalmedicine.51.7056.

100. Perrier E, Armstrong L, Daudon M, et al. From State to Process: Defining hydration. *Obes Facts*. 2014;7(SUPPL. 2):6–12. doi:10.1159/000360611.

101. Crawley H, Hocking E. *Eating well: supporting older people and older people with dementia*. Abbots Langley; 2011. Available at: http://www.cwt.org.uk/pdfs/OlderPeople.pdf.

102. Food Standards Agency. *Guidance on food served to older people in residential care*.; 2007.

103. Centers for Medicare & Medicaid Services. *Long-Term Care Facility Resident Assessment Instrument (RAI) 3.0 User's Manual*.; 2015. Available at: https://www.cms.gov/Medicare/Quality.../MDS-30-RAI-Manual-V113.pdf, accessed 16/11/2015.

104. Gaspar PM. What determines how much patients drink? *Geriatr Nurs*. 1988;July/Aug(4):221–224.

105. Chernoff R. Meeting the Nutritional Needs of the elderly in the institutional setting. *Nutr Rev*. 1994;42(4):132–136.

106. Holben D, Hassell J, Williams J, Helle B. Fluid intake compared with established standards and symptoms of dehydration among elderly residents of a long-term care facility. *J Am Diet Assoc*. 1999;99(11):1447–50.

107. Hooper L, Whitelock S, Bunn DK. Beating dehydration – one specialist dementia home shows how to do it. *Nurs Times*. 2015;111(34/5):16–19.

108. Kenkmann A, Price GM, Bolton J, Hooper L. Health, wellbeing and nutritional status of older people living in UK care homes: an exploratory evaluation of changes in food and drink provision. *BMC Geriatr*. 2010;10(28):28. doi:10.1186/1471-2318-10-28.

109. Mentes J, Culp K. Reducing hydration-linked events in nursing home residents... including commentary by Godkin D. *Clin Nurs Res*. 2003;12(3):210–228. doi:10.1177/1054773803252996.

110. Robinson SB, Rosher RB. Can a Beverage Cart Help Improve Hydration? *Geriatr Nurs*. 2002;23(4):208–211.

111. Willms S, Peinelt V, Kohl O, Hartig W. Development of a fluid intake concept to improve the intake of beverages by aged nursing home inmates. [German]. *Aktuel Ernaehr Med*. 2003;4:235–239.

112. Zembrzuski CD. A three-dimensional approach to hydration of elders: administration, clinical staff, and in-service education. *Geriatr Nurs*. 1997;18(1):20–6.

113. Simmons SF, Alessi C, Schnelle JF. An Intervention to Increase Fluid Intake in Nursing Home Residents: Prompting and Preference Compliance. *J Am Geriatr Soc*. 2001;49:926–933.

114. Spangler PF, Risley T, Bilyhew DD. The Management of dehydration and incontinence in non-ambulatory geriatric patients. *J Appl Behav Anal*. 1984;17:397–401.

115. Tanaka Y, Nagata K, Tanaka T, et al. Can an individualized and comprehensive care strategy improve urinary incontinence (UI) among nursing home residents? *Arch Gerontol Geriatr*. 2009;49(2):278–283. doi:10.1016/j.archger.2008.10.006.

116. Gandy J. Water intake: validity of population assessment and recommendations. *Eur J Nutr*. 2015;54(S2):11–16. doi:10.1007/s00394-015-0944-8.

117. Office for National Statistics. *Changes in the Older Resident Care Home Population between 2001 and 2011*. London; 2014. Available at: www.ons.gov.uk, accessed 11/01/2016.

118. Holzapfel SK, Ramirez RF, Layton MS, Smith IW, Sagl Massey K, DuBose JZ. Feeder position and food and fluid consumed by nursing home residents. *J Gerontol Nurs*. 1996;22:54–55.

119. Hodgkinson B, Evans D, Wood J. Maintaining oral hydration in older adults: a systematic review. *Joanna Briggs Inst Evid Based Nurs Midwifery*. 2001;12:1–66.

120. Godfrey H, Cloete J, Dymond E, Long A. An exploration of the hydration care of older people: a qualitative study. *Int J Nurs Stud*. 2012;49(10):1200–11. doi:10.1016/j.ijnurstu.2012.04.009.

121. Anglian Water Services. *Health on tap – a campaign to promote good hydration in older people in residential care from*. Huntingdon; 2009. Available at: www.anglianwater.co.uk/_assets/media/health-on-tap-good-hydration-report.pdf. Accessed 06/02/2013.

122. Wu S, Barker J. Hot Tea and Juk. *J Geront Nurs*. 2008;34(11):46–55.

123. Mentes J. A typology of oral hydration problems exhibited by frail nursing home residents. *J Gerontol Nurs*. 2006;32(1):13–19.

124. Mentes J, Chang BL, Morris J. Keeping Nursing Home Residents Hydrated. *West J Nurs Res*. 2006;28:392–406.

125. Ullrich S, McCutcheon H. Nursing practice and oral fluid intake of older people with dementia. [References]. *J Clin Nurs*. 2008;Vol.17(21):2910–2919. doi:10.1111/j.1365-2702.2007.02274.x.

126. Kayser-Jones J. Factors contributing to dehydration in nursing homes: inadequate staffing and lack of professional supervision. *J Am Geriatr Soc*. 1999;47(10):1187–1194.

127. De Bellis A, Willick C, Mitchell P, Roder-Allen G. Food for thought: residents with dementia who require assistance with eating and drinking. *Geriaction*. 2003;21(3):5–10.

128. Bernoth MA, Dietsch E, Davies C. “Two dead frankfurts and a blob of sauce”: The serendipity of receiving nutrition and hydration in Australian residential aged care. *Collegian*. 2014;21(3):171–177. doi:10.1016/j.colegn.2013.02.001.

129. Bossuyt PM, Reitsma JB, Bruns DE, et al. STARD 2015: An Updated List of Essential Items for Reporting Diagnostic Accuracy Studies. *BMJ*. 2015;351(October). doi:10.1136/bmj.h5527.

130. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS med*. 2009;6(7):e1000097. doi:10.1371/journal.pmed.1000097.

131. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. *Int J Qual Heal C*. 2007;19(6):349–57. doi:10.1093/intqhc/mzm042.

132. O'Neill A P, Faragher B E, Davies I, Wears R, McLean A K, Fairweather S D. Reduced survival with increasing plasma osmolality in elderly continuing-care patients. *Age Ageing*. 1990;19(1):68–71. Available at: http://search.ebscohost.com/login.aspx?direct=true&db=jlh&AN=2011110833&site=ehost-live.

133. O'Neill PA. Aging and salt and water balance. *Rev Clin Gerontol*. 1996;6(04):305. doi:10.1017/S095925980000232X.

134. Cheuvront SN, Fraser CG, Kenefick RW, Ely BR, Sawka MN. Reference change values for monitoring dehydration. *Clin Chem Lab Med*. 2011;49(6):1033–7. doi:10.1515/CCLM.2011.170.

135. Fraser CG, Cummings ST, Wilkinson SP, et al. Biological variability of 26 clinical chemistry analytes in elderly people. *Clin Chem*. 1989;35(5):783–786.

136. National Research Ethics Service (NRES). *Information sheets and consent forms. Guidance for researchers. Version 3.6.1 (March)*. National Research Ethics Service (NRES); 2011. Available at: Accessed 25/11/2013, but no longer available. Replaced by: Consent & Participant Information Sheet Preparation Guidance, 03/03/214; http://www.hra-decisiontools.org.uk/consent/.

137. Folstein MF, Folstein SE, McHugh PR. Mini-mental state. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975;12(3):189–198.

138. Hooper L, Attreed N, Campbell W, et al. Clinical and physical signs for identification of impending and current water-loss dehydration in older people (Protocol). Collaboration C, ed. *Cochrane Libr*. 2012;(2). Available at: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD009647/pdf.

139. Gross CR, Lindquist RD, Woolley A, Granieri R, Allard K, Webster R. Clinical Indicators of Dehydration Severity in Elderly Patients. *J Emerg Med*. 1992;10:267–274.

140. Rowat A, Graham C, Dennis M. Dehydration in hospital-admitted stroke patients: detection, frequency, and association. *Stroke*. 2012;43(3):857–9. doi:10.1161/STROKEAHA.111.640821.

141. Vivanti A, Harvey K, Ash S, Battistutta D. Clinical assessment of dehydration in older people admitted to hospital: what are the strongest indicators? *Arch Gerontol Geriatr*. 2008;47(3):340–55. doi:10.1016/j.archger.2007.08.016.

142. Cheuvront SN, Ely BR, Kenefick RW, Sawka MN. Biological variation and diagnostic accuracy of dehydration assessment markers. *Am J Clin Nutr*. 2010;92(3):565–573.

143. University of East Anglia. *Information Classification and Data Management policy, v2.0.*; 2012. Available at: www.uea.ac.uk/ (accessed 31/10/2013).

144. IBM Corp. IBM SPSS Statistics for Windows, version 22.0. 2013.

145. Microsoft Corporation. Microsoft Office. 2010.

146. Tombaugh T, McIntyre N. The Mini-Mental State Examiation: A Comprehensive Review. *J Am Geriatr Soc*. 1992;40(9):922–935.

147. Mahoney F, Barthel D. Functional evaluation: the Barthel Index. *Md State Med J*. 1965;14:56–61.

148. CQC. How to get and re-use CQC information and data. Available at: http://www.cqc.org.uk/content/how-get-and-re-use-cqc-information-and-data#directory. Accessed May 29, 2015.

149. Department of Health. *Dementia: a state of the nation report on dementia care and support in England*.; 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/262139/Dementia.pdf.

150. Viera AJ, Garrett JM. Understanding interobserver agreement: The kappa statistic. *Fam Med*. 2005;37(5):360–363. doi:Vol. 37, No. 5.

151. Cicchetti D, Sparrow S. Developing criteria for establishing interrater reliability of specific items: Applications to assessment of adaptive behavior. *Am J Ment Defic*. 1981;86(2):127–137.

152. Stotts NA, Hopf HW, Kayser-Jones J, Chertow GM, Cooper BA, Wu H-SS. Increased fluid intake does not augment capacity to lay down new collagen in nursing home residents at risk for pressure ulcers: a randomized, controlled clinical trial. *Wound Repair Regen*. 2009;17(6):780–788. doi:10.1111/j.1524-475X.2009.00539.x.

153. O’Neill PA. Elderly female patients in continuing care: Why are they hyperosmolar? *Gerontology*. 1989;35:205–9.

154. Taniguchi H, Tsuru T, Tanaka A, Naruse T, Matsuyama S, Ushigome K. “Pre-dehydration” is a clinical condition present prior to “morbid dehydration” in 391 elderly individuals and suggestions for diagnostic variables and risk factors for dehydration. *Clin Nutr*. 2014;33(Suppl 1):s40.

155. Parekh N, Ali K. Conceptualizing the participation of older people as consumers in research. *Eur Geriatr Med*. 2015:9–11. doi:10.1016/j.eurger.2015.08.004.

156. Taniguchi H, Akiyama M, Gomi I, Kimura M. Development of a pre-dehydration assessment sheet: Research among elderly individuals who regularly visited an elderly-care institution. *Nippon Ronen Igakkai Zasshi (Japanese J Geriatr*. 2015;52:359–366.

157. Sedgwick P. Convenience sampling. *BMJ*. 2013;347(oct25 2):f6304–f6304. doi:10.1136/bmj.f6304.

158. Rodger M, Ramsay T, Fergusson D. Diagnostic randomized controlled trials: the final frontier. *Trials*. 2012;13(1):137. doi:10.1186/1745-6215-13-137.

159. Deeks JJ. Using evaluations of diagnostic tests: Understanding their limitations and making the most of available evidence. *Ann Oncol*. 1999;10(7):761–768. doi:10.1023/A:1008359805260.

160. Chiao FB, Resta-Flarer F, Lesser J, et al. Vein visualization: Patient characteristic factors and efficacy of a new infrared vein finder technology. *Brit J Anaesth*. 2013;110(February):966–971. doi:10.1093/bja/aet003.

161. Mbamalu D, Banerjee A. Methods of obtaining peripheral venous access in difficult situations. *Postgr Med J*. 1999;75(March):459–462. doi:10.1136/pgmj.75.886.459.

162. Gorelick MH, Shaw KN, Murphy KO. Validity and Reliability of Clinical Signs in the Diagnosis of Dehydration in Children. *Pediatrics*. 1997;99(5):e6–e6. doi:10.1542/peds.99.5.e6.

163. Green-Hennessey S. Cochrane systematic reviews for the mental health field: is the gold standard tarnished? *Psychiatr Serv*. 2013;64(1):65–70.

164. Smith R. The cochrane collaboration at 20. *BMJ*. 2013;347(December):f7383. doi:10.1136/bmj.f7383.

165. World Health Organization. Definition of an older or elderly person. Available at: http://www.who.int/healthinfo/survey/ageingdefnolder/en/. Accessed May 14, 2012.

166. Ribbe MW, Ljunggren G, Steel K, et al. Nursing Homes in 10 Nations: A Comparison Between Countries and Settings. *Age Ageing*. 1997;26(suppl 2):3–12. doi:10.1093/ageing/26.suppl_2.3.

167. Bunn DK, Hooper L. Effectiveness of external factors to reduce the risk of dehydration in older people living in residential care: a systematic review. *www.crd.york.ac.uk/Prospero2012: CRD42012003100*. 2012. Available at: www.crd.york.ac.uk/Prospero/display_record.asp?ID=CRD42012003100.

168. Higgins J, Altman D. Chapter 8: Assessing risk of bias in included studies. In: Higgins J, Green S, eds. *Cochrane Handbook*. Chichester: John Wiley & Sons; 2008:187–241.

169. Wells G, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomized studies in meta-analyses. Available at: http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp. Accessed October 1, 2012.

170. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. *Eur J Epidemiol*. 2010;25(9):603–5. doi:10.1007/s10654-010-9491-z.

171. Reeves B, Deeks JJ, Higgins J, Wells G. Including non-randomised studies. In: Higgins J, Green S, eds. *Cochrane Handbook of Sytematic Reviews*. Chichester: John Wiley & Sons; 2008:391–431.

172. Deeks JJ, Dinnes J, D'Amico R, et al. Evaluating non-randomised intervention studies. *Heal Technol Asses*. 2003;7(27):iii–x, 1–173.

173. Centre for Reviews and Dissemination. *Systematic Reviews: CRD's Guidance for Undertaking Reviews in Health Care*. York: CRD, University of York; 2009. Available at: http://www.york.ac.uk/inst/crd/pdf/Systematic_Reviews.pdf.

174. The Nordic Cochrane Centre TCC. Review Manager (RevMan), Version 5.2 [Computer Program]. 2012.

175. Allison R, Ray Lewis A, Liedtke R, Buchmeyer ND, Frank H. Early identification of hypovolemia using total body resistance measurements in long-term care facility residents. *Gend Med*. 2005;2(1):19–34.

176. Dunne TE, Neargarder SA, Cipolloni PB, Cronin-Golomb A. Visual contrast enhances food and liquid intake in advanced Alzheimer's disease. *Clin Nutr*. 2004;23(4):533–8. doi:10.1016/j.clnu.2003.09.015.

177. Fries BE, Hawes C, Morris JN, Phillips CD, Mor V, Park PS. Effect of the National Resident Assessment Instrument on selected health conditions and problems. *J Am Geriatr Soc*. 1997;45:994–1001.

178. Mentes J. Hydration management: A long-term care nursing intervention to prevent acute confusion and other hydration-linked events. *Dr Diss*. 2000.

179. Reed PS, Zimmerman S, Sloane PD, Williams CS, Boustani M. Characteristics associated with low food and fluid intake in long-term care residents with dementia. *Gerontol*. 2005;45(Special Issue 1):74–80.

180. Welch IK, Campbell S, Crowley R. Oral hydration solution effects on fluid status of the elderly. *J Nutr Elder*. 1996;16(1):1–10.

181. Zembrzuski CD. Oral fluid intake and the effect on postural blood pressure and falls in skilled nursing facility residents. *Dr Diss*. 2006.

182. Cleary S, Hopper T, Forseth M, Soest D Van. Using routine seating plans to improve mealtimes for residents with dementia. *Can Nurs Home*. 2008;19(3):4–10.

183. McGregor MJ, Tate RB, McGrail KM, Ronald LA, Broemeling AM, Cohen M. Care outcomes in long-term care facilities in British Columbia, Canada. Does ownership matter? *Med Care*. 2006;44:929–935.

184. Taylor KA, Barr SI. Provision of small, frequent meals does not improve energy intake of elderly residents with dysphagia who live in an extended-care facility. *J Am Diet Assoc*. 2006;106:1115–1118.

185. Allen V, Methven L, Gosney M. Impact of serving method on the consumption of nutritional supplement drinks: randomized trial in older adults with cognitive impairment. *J Adv Nurs*. 2014;70(6):1323–1333. doi:10.1111/jan.12293.

186. McCormick SE, Stafford KM, Carmody E, et al. The efficacy of pre-thickened fluids on total fluid and nutrient consumption among extended care residents

requiring thickened fluids due to risk of aspiration. British Geriatrics Society: Abstracts of papers presented at the Spring Scientific Meeting. *Age Ageing*. 2006;35:i31–i31.

187. Bunn D, Jimoh F, Howard S. Increasing Fluid Intake and Reducing Dehydration Risk in Older People Living in Long-Term Care : A Systematic Review. *J Am Med Dir Assoc*. 2015;16(2):101–113. doi:10.1016/j.jamda.2014.10.016.

188. Allen V, Methven L, Gosney M. A comparison of the amount of Oral Nutritional Supplement drinks consumed between two randomly allocated drinking methods. *Proc Nutr Soc*. 2011;70(OCE5):E304. doi:10.1017/S0029665111003892.

189. McCormick SE, Stafford KM, Saqib G, Power D. The efficacy of pre-thickened fluids on total fluid and nutrient consumption among extended care residents requiring thickened fluids due to risk of aspiration [letter]. *Age Ageing*. 2008;37:714–8.

190. Culp K, Mentes J, Wakefield B. Hydration and acute confusion in long-term care residents. *West J Nurs Res*. 2003;25(3):267–268.

191. Dyck MJ. Nursing staffing and resident outcomes in nursing homes: weight loss and dehydration. *J Nurs Care Qual*. 2007;22(1):59–65.

192. Phillips C, Morris J, Hawes C, et al. Association of the RAI with changes in functino, cognition and psychosocial status. *J Am Geriatr Soc*. 1997;45:986–993.

193. Simmons SF, Rahman A. Next Steps for Achieving Person-Centered Care in Nursing Homes. *J Am Med Dir Assoc*. 2014;15(9):615–9.

194. National Institute for Health and Care Excellence (NICE). *Process and Methods Guides*. London; 2012. Available at: http://www.nice.org.uk/.

195. Morley J, Caplan GA, Cesari M, et al. International Survey of Nursing Home Research Priorities. *J Am Med Dir Assoc*. 2014;15(5):309–12. doi:doi: 10.1016/j.jamda.2014.03.003.

196. National Insitute of Health Research. ENRICH (Enabling Research in Care Homes). Available at: http://enrich.nihr.ac.uk/. Accessed December 15, 2015.

197. Blaikie N. *Approaches to Social Enquiry*. 2nd ed. Cambridge: Polity Press; 2007.

198. Mason J. *Qualitative Researching*. First. London: Sage Publications; 2002.

199. Willis J. World views, paradigms and the practice of social science research. In: *Foundations of qualitative research*. ?New York: Sage Publications; 2007:1–26.

200. Blaikie N. *Designing Social Research*. 2nd ed. Cambridge: Polity Press; 2010.

201. Crotty M. *The Foundations of Social Research*. Thousand Oaks, CA: Sage Publications; 1998.

202. Guba EG, Lincoln YS. Competing Paradigms in Qualitative Research. In: Denzin N, Lincoln YS, eds. *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage; 1994:105–117.

203. Brannick T, Coghlan D. Reflexivity in Management and Business Research. *Irish J Manag*. 2007;27(2):143–160. doi:10.1111/1467-6486.00380.

204. Lincoln YS, Guba EG. *Naturalistic Enquiry*. Beverley Hills: Sage; 1985.

205. Onwuegbuzie A, Leech NL. Sampling Designs in Qualitative Research : Making the Sampling Process More Public. *Qual Rep*. 2007;12(2):19–20.

206. Barbour R. *Doing Focus Groups*. 1st ed. London: Sage Publications; 2007.

207. Kitzinger J. Qualitative Research: Introducing focus groups. *BMJ*. 1995;311(7000):299–302.

208. Morgan DL. Focus Groups. *Annu Rev Sociol*. 1996;22(1):129–152. doi:10.1146/annurev.soc.22.1.129.

209. Gibbs A. Social Reserach Update: Focus Groups. *Soc Res Updat*. 1997. Available at: http://sru.soc.surrey.ac.uk/SRU19.html. Accessed October 9, 2013.

210. Jayasekara RS. Focus groups in nursing research: methodological perspectives. *Nurs Outlook*. 2012;60(6):411–6. doi:10.1016/j.outlook.2012.02.001.

211. Killett A, Burns D, Kelly F, et al. Digging deep: how organisational culture affects care home residents' experiences. *Ageing Soc*. 2014;36(1):1–29. doi:10.1017/S0144686X14001111.

212. Kroll T, Barbour R, Harris J. Using focus groups in disability research. *Qual Heal Res*. 2007;17(5):690–8. doi:10.1177/1049732307301488.

213. Luff R, Ferreira Z, Meyer J. *Care Homes*. London School of Economics: School for Social Care Research; 2011.

214. Beuscher L, Grando VT. Challenges in conducting qualitative research with individuals with dementia. *Res Gerontol Nurs*. 2009;2(1):6–11.

215. Wahyuni D. The Research Design Maze: Understanding Paradigms, Cases, Methods and Methodologies. *JAMAR*. 2012;10(1):69–80.

216. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3:77–101.

217. Massey OT. A proposed model for the analysis and interpretation of focus groups in evaluation research. *Eval Program Plann*. 2011;34(1):21–8. doi:10.1016/j.evalprogplan.2010.06.003.

218. Belzile J a., Oberg G. Where to begin? Grappling with how to use participant interaction in focus group design. *Qual Res*. 2012;12(4):459–472. doi:10.1177/1468794111433089.

219. National Research Ethics Service (NRES). *Does my project require review by a Research Ethics Committee?*; 2012. Available at: Accessed 25/11/2013, but no longer available.

220. Dobson C. *Conducting research with people not having the capacity to consent to their participation. A practical guide for researchers*. Leicester; 2008.

221. Her Majesty's Government. *The Mental Capacity Act*. UK; 2005:Chapter 9. Available at: http://www.legislation.gov.uk/ukpga/2005/9/pdfs/ukpga_20050009_en.pdf. Accessed November 1, 2013.

222. Mccosker H, Barnard A, Gerber R. Undertaking Sensitive Research : Issues and Strategies for Meeting the Safety Needs of All Participants 2 . The Phenomenon of " Sensitive " Research. *Forum Qual Soc Res*. 2001;2(1).

223. Newman E, Walker EA, Gefland A. Law , Ethics , and Psychiatry in the General Hospital Trauma-Focused Research. *Gen Hosp Psychiatry*. 1999;8343(99):187–196.

224. Kitzinger J. The methodology of Focus Groups: the importance of interaction between research participants. *Sociol Heal Ill*. 1994;16(1):103–121. doi:10.1111/1467-9566.ep11347023.

225. QSR International. NVIVO. 2012:-. Available at: http://www.qsrinternational.com/products_nvivo.aspx.

226. Sim J. Collecting and Analysing qualitative data: issues raised by the focus group. *J Adv Nurs*. 1998;28(2):345–352.

227. Ashworth R. More than just a cup of tea: everyday cultural practices and interactions in research. *Gener Rev*. 2014;24(3):4–10. Available at: http://www.britishgerontology.org/generations-review/gr-issues-2007-to-present.html. Accessed 20/09/2015.

228. Caplan P. Approaches to the study of food, health and identity. In: Caplan P, ed. *Food, Health and Identity*. London: Routledge; 1997:1–32.

229. Gusfield J. Passage to play: rituals of drinking time in American society. In: Douglas M, ed. *Constructive Drinking*. Cambridge: Cambridge University Press; 1987:73–90.

230. Philpin S, Merrell J, Warring J, Hobby D, Gregory V. Memories, identity and homeliness: the social construction of mealtimes in residential care homes in South Wales. *Ageing Soc*. 2013:1–37. doi:10.1017/S0144686X12001274.

231. Dietrich A. Aesthetic issues for drinking water. *J Water Heal*. 2006;4(suppl 1):11–16. doi:10.2166/wh.2005.034.

232. Ruxton C, Phillips F, Bond T. Is tea a healthy source of hydration? *Nutr Bull*. 2015;40(3):166–176. doi:10.1111/nbu.12150.

233. Hazan H. Holding time still with cups of tea. In: Douglas M, ed. *Constructive Drinking*. Cambridge: Cambridge University Press; 1987:205–219.

234. Hannam D. More than a cup of tea: Meaning construction in an everyday occupation. *J Occup Sci*. 1997;4(2):69–73. doi:10.1080/14427591.1997.9686423.

235. Fukunaga A, Uematsu H, Sugimoto K. Influences of aging on taste perception and oral somatic sensation. *J Gerontol A Biol Sci Med Sci*. 2005;60(1):109–113. doi:10.1093/gerona/60.1.109.

236. Lievesley M. Rethinking dental and oral healthcare services in residential care settings - a design approach. In: *British Society of Gerontology 44th Annual Meeting, Newcastle*. Newcastle: British Society of Gerontology; 2015. Available at: http://conferences.ncl.ac.uk/bsg2015/. Accessed 21/08/2015.

237. Baltes P, Baltes M. Psychological perspectives on successful aging: The model of selective optimization with compensation. In: Baltes P, Baltes M, eds. *Perspectives from the behavioral sciences*. Cambridge: Cambridge University Press; 1990.

238. Lupton D. *Food, the body and the self*. London: Sage Publications; 1996.

239. Jimoh F, Bunn DK, Hooper L. Assessment of a self-reported Drinks Diary for the estimation of drinks intake by care home residents: Fluid Intake Study in the Elderly (FISE). *J Nutr Heal Aging*. 2015;19(5):491–496.

240. Orona C. Temporality and identity loss due to Alzheimer's disease. *Soc Sci Med*. 1990;30(11):1247–1256.

241. Sidenvall B. Meal procedures in institutions for elderly people: A theoretical interpretation. *J Adv Nurs*. 1999;30(2):319–328. doi:10.1046/j.1365-2648.1999.01082.x.

242. Hydrate for Health. 2013. Available at: http://www.hydrateforhealth.co.uk/. Accessed August 29, 2015.

243. Gibson G, Dickinson C, Brittain K, Robinson L. The everyday use of assistive technology by people with dementia and their family carers: a qualitative study. *BMC Geriatr*. 2015;15(1):89. doi:10.1186/s12877-015-0091-3.

244. Parette P, Scherer M. Assistive Technology Use and Stigma. *Educ Train Dev Disabil*. 2004;39(3):217–226.

245. Goffman E. *Stigma: Notes on the management of spoiled identity*. Englewood Cliffs, New Jersey: Prentice Hall; 1963.

246. Royal College of Nursing. The RCN's defnition of dignity. 2008. Available at: http://www.rcn.org.uk/__data/assets/pdf_file/0003/191730/003298.pdf. Accessed September 25, 2015.

247. Pritchard G, Brittain K. *Understanding Older People's Use of Assistive Technology (AT)*. Newcastle Available at:

http://thesaltproject.moonfruit.com/download/i/mark_dl/u/4012741570/4612528105/WP4. D2. Report on key findings on current perspectives on care provision and th.pdf. Accessed 24/09/2015.

248. Pettersson I, Appelros P, Ahlstrom G. Lifeworld perspectives utilizing assistive devices: Individuals, lived experience following a stroke. *Can J Occup Ther*. 2007;74(I):15–26. doi:10.2182/cjot.06.05.

249. Gastmans C. Meals in nursing homes. An ethical appraisal. *Scand J Caring Sci*. 1998;12(4):231–237. doi:http://dx.doi.org/10.1080/02839319850162841.

250. Stroebele N, De Castro JM. Effect of ambience on food intake and food choice. *Nutrition*. 2004;20(9):821–838. doi:10.1016/j.nut.2004.05.012.

251. Herman CP. The social facilitation of eating . A review. *Appetite*. 2015;86:61–73. doi:10.1016/j.appet.2014.09.016.

252. Engell D, Kramer M, Malafi T, Salomon M, Lesher L. Effects of effort and social modeling on drinking in humans. *Appetite*. 1996;26(2):129–138. doi:10.1006/appe.1996.0011.

253. Sidenvall B, Fjellström C, Anna-Christina E. Cultural perspectives of meals expressed by patients in geriatric care. *Int J Nurs Stud*. 1996;33(2):212–222. doi:10.1016/0020-7489(95)00042-9.

254. Manthorpe J, Watson R. Poorly served? Eating and dementia. *J Adv Nurs*. 2003;41(2):162–9.

255. Kelly F, Innes A, Dincarslan D. Improving Care Home Design for People with Dementia. *J Care Serv Manag*. 2011;5(3):147–155.

256. Liberati EG, Gorli M, Moja L, Galuppo L, Ripamonti S, Scaratti G. Exploring the practice of patient centered care: The role of ethnography and reflexivity. *Soc Sci Med*. 2015;133:45–52. doi:10.1016/j.socscimed.2015.03.050.

257. Ryan A. Transitions in care: Family carers' experiences of nursing home placement. *NTResearch*. 2002;7(5):324–334.

258. Keene J, Hope T, Rogers P, Elliman N. An investigation of satiety in ageing, dementia and hyperphagia. *Int J Eat Disord*. 1996;23:409.

259. Nolan M, Dellasega C. "It"s not the same as him being at home': creating caring partnerships following nursing home placement. *J Clin Nurs*. 1999;8(6):723–730. doi:10.1046/j.1365-2702.1999.00325.x.

260. Ryan A, Scullion HF. Nursing home placement: an exploration of the experiences of family carers. *J Adv Nurs*. 2000;32(5):1187–95. doi:jan1589 [pii].

261. Kellett U. Transition in care: Family carers' experience of nursing home replacement. *J Adv Nurs*. 1999;29(6):1474–1481.

262. Buckwalter KC, Hall G. Families of the institutionalised older adult: a neglected resource. In: Brubaker T, ed. *Ageing and Health and Family: Long-Term care*. Newbury Park: Sage; 1987:176–196.

263. Bowers BJ. Family perceptions of care in a nursing home. *Gerontologist*. 1988;28(3):361–368.

264. Ryan A, Scullion HF. Family and staff perceptions of the role of families in nursing homes. *J Adv Nurs*. 2000;32(3):626–34.

265. Breen G-M, Matusitz J, Wan TTH. The Use of Public Policy Analysis to Enhance the Nursing Home Reform Act of 1987. *Soc Work Heal Care*. 2009;48(5):505–518. doi:10.1080/00981380902734630.

266. Kayser-Jones J. Inadequate staffing at mealtime. *J Geront Nurs*. 1997;23(8):14–21.

267. Killett A, Hyde P, Burns D, Gray R, Poland F. How organizational factors interact to influence the quality of care of older people in the care home sector. *J Heal Serv Res Policy*. 2013;18(1 Suppl):14–22. doi:10.1177/1355819613476016.

268. Shepherd A. Measuring and managing fluid balance. *Nurs Times*. 2011;107(28):12.

269. Sidenvall B, Ek a C. Long-term care patients and their dietary intake related to eating ability and nutritional needs: nursing staff interventions. *J Adv Nurs*. 1993;18(4):565–573.

270. Zolnierek CD. An Integrative Review of Knowing the Patient. *J Nurs Sch*. 2014;46(1):3–10. doi:10.1111/jnu.12049.

271. Cruwys T, Bevelander KE, Hermans RCJ. Social modeling of eating : A review of when and why social influence affects food intake and choice. *Appetite*. 2015;86:3–18. doi:10.1016/j.appet.2014.08.035.

272. Popham C, Orrell M. What matters for people with dementia in care homes ? Aging and mental health. *Aging Ment Heal*. 2012;16(2):181–188.

273. Van Haitsma K, Crespy S, Humes S, et al. New toolkit to measure quality of person-centered care: development and pilot evaluation with nursing home communities. *J Am Med Dir Assoc*. 2014;15(9):671–80. doi:10.1016/j.jamda.2014.02.004.

274. Eritz H, Hadjistavropoulos T, Williams J, et al. A life history intervention for individuals with dementia: a randomised controlled trial examining nursing staff empathy, perceived patient personhood and aggressive behaviours. *Ageing Soc*. 2015:1–29. doi:10.1017/S0144686X15000902.

275. Kelly F. Recognising and supporting self in dementia: a new way to facilitate a person-centred approach to dementia care. *Ageing Soc*. 2010;30(01):103–124. doi:10.1017/S0144686X09008708.

276. Schermer M. Nothing but the truth? On truth and deception in dementia care. *Bioethics*. 2007;21(1):13–22. doi:10.1111/j.1467-8519.2007.00519.x.

277. James I, Wood-Mitchell a J, Waterworth a M, Mackenzie LE, Cunningham J. Lying to people with dementia: developing ethical guidelines for care settings. *Int J Geriatr Psychiatry*. 2006;21(8):800–801. doi:10.1002/gps.1551.

278. Day AM, James I a., Meyer TD, Lee DR. Do people with dementia find lies and deception in dementia care acceptable? *Aging Ment Heal*. 2011;15(7):822–829. doi:10.1080/13607863.2011.569489.

279. Brown Wilson C, Davies S, Nolan M. Developing personal relationships in care homes: realising the contributions of staff, residents and family members. *Ageing Soc*. 2009;29:1041–1063. doi:10.1017/S0144686X0900840X.

280. Sandelowski M. Focus on Qualitative Methods Sample Size in Qualitative. *Res Gerontol Nurs*. 1995;18:179–183.

281. Liamputtong P, Ezzy D. Focus Groups. In: *Qualitative Research Methods*. 2nd ed. Oxford: Oxford University Press; 2005:75–99.

282. Burke Johnson R, Onwuegbuzie A. Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educ Res*. 2004;33(14):14–26. doi:10.3102/0013189X033007014.

283. Bryman A. Barriers to integrating Quantitative and Qualitative Research. *J Mix Methods Res*. 2007;1(1):8–22.

284. Bryman A. Paradigm Peace and the Implications for Quality. *Int J Soc Res Methodol*. 2006;9(2):111–126. doi:10.1080/13645570600595280.

285. Hall S, Longhurst S, Higginson IJ. Challenges to conducting research with older people living in nursing homes. *BMC Geriatr*. 2009;9:38. doi:10.1186/1471-2318-9-38.

Appendices

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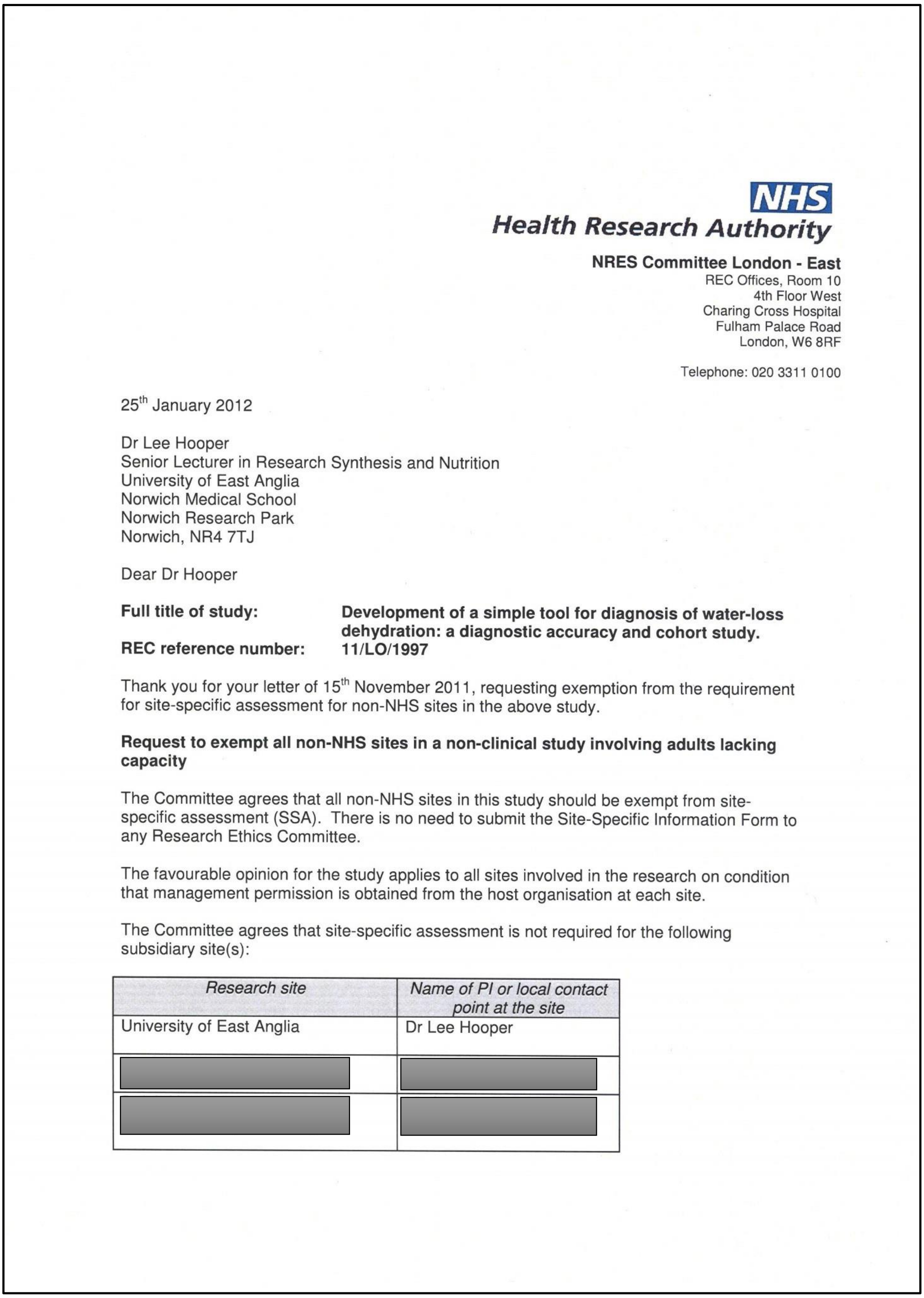
Appendix 1: STARD 2015 Checklist[129]

Section & Topic	No	Item	Reported in section:
TITLE OR ABSTRACT			
	1	Identification as a study of diagnostic accuracy using at least one measure of accuracy (such as sensitivity, specificity, predictive values, or AUC)	Chapter 4
ABSTRACT			
	2	Structured summary of study design, methods, results, and conclusions (for specific guidance, see STARD for Abstracts)	Chapter 4
INTRODUCTION			
	3	Scientific and clinical background, including the intended use and clinical role of the index test	4.3
	4	Study objectives and hypotheses	3.4.1; 4.2
METHODS			
Study design	**5**	Whether data collection was planned before the index test and reference standard were performed (prospective study) or after (retrospective study)	4.6
Participants	**6**	Eligibility criteria	4.6.2
	7	On what basis potentially eligible participants were identified (such as symptoms, results from previous tests, inclusion in registry)	4.6.2
	8	Where and when potentially eligible participants were identified (setting, location and dates)	4.6.1; 4.6.2
	9	Whether participants formed a consecutive, random or convenience series	4.6.1; 4.6.2
Test methods	**10a**	Index test, in sufficient detail to allow replication	Table 4-1
	10b	Reference standard, in sufficient detail to allow replication	4.6.5
	11	Rationale for choosing the reference standard (if alternatives exist)	2.9.2.2; 4.3.2
	12a	Definition of and rationale for test positivity cut-offs or result categories of the index test, distinguishing pre-specified from exploratory	4.6.9
	12b	Definition of and rationale for test positivity cut-offs or result categories of the reference standard, distinguishing pre-specified from exploratory	4.6.5
	13a	Whether clinical information and reference standard results were available to the performers/readers of the index test	4.8.4.5
	13b	Whether clinical information and index test results were available to the assessors of the reference standard	4.8.4.5
Analysis	**14**	Methods for estimating or comparing measures of diagnostic accuracy	4.6.9
	15	How indeterminate index test or reference standard results were handled	4.7.1
	16	How missing data on the index test and reference standard were handled	4.7.3.1
	17	Any analyses of variability in diagnostic accuracy, distinguishing pre-specified from exploratory	-
	18	Intended sample size and how it was determined	4.6
RESULTS			
Participants	**19**	Flow of participants, using a diagram	Figure 4-3
	20	Baseline demographic and clinical characteristics of participants	Table 4-2
	21a	Distribution of severity of disease in those with the target condition	Table 4-2
	21b	Distribution of alternative diagnoses in those without the target condition	-
	22	Time interval and any clinical interventions between index test and reference standard	4.6.4

Test results	**23**	Cross tabulation of the index test results (or their distribution) by the results of the reference standard	Table 4-4; Figures 4-4 to 4-46
	24	Estimates of diagnostic accuracy and their precision (such as 95% confidence intervals)	Table 4-4; Figures 4-4 to 4-46
	25	Any adverse events from performing the index test or the reference standard	4.6.10
DISCUSSION			
	26	Study limitations, including sources of potential bias, statistical uncertainty, and generalisability	4.8
	27	Implications for practice, including the intended use and clinical role of the index test	4.8
OTHER INFORMATION			
	28	Registration number and name of registry	4.4
	29	Where the full study protocol can be accessed	4.8.3.1
	30	Sources of funding and other support; role of funders	Page 4

Appendix 2: DRIE Ethics Approval Letter



NHS
Health Research Authority

NRES Committee London - East
REC Offices, Room 10
4th Floor West
Charing Cross Hospital
Fulham Palace Road
London, W6 8RF

Telephone: 020 3311 0100

25th January 2012

Dr Lee Hooper
Senior Lecturer in Research Synthesis and Nutrition
University of East Anglia
Norwich Medical School
Norwich Research Park
Norwich, NR4 7TJ

Dear Dr Hooper

Full title of study: **Development of a simple tool for diagnosis of water-loss dehydration: a diagnostic accuracy and cohort study.**
REC reference number: **11/LO/1997**

Thank you for your letter of 15th November 2011, requesting exemption from the requirement for site-specific assessment for non-NHS sites in the above study.

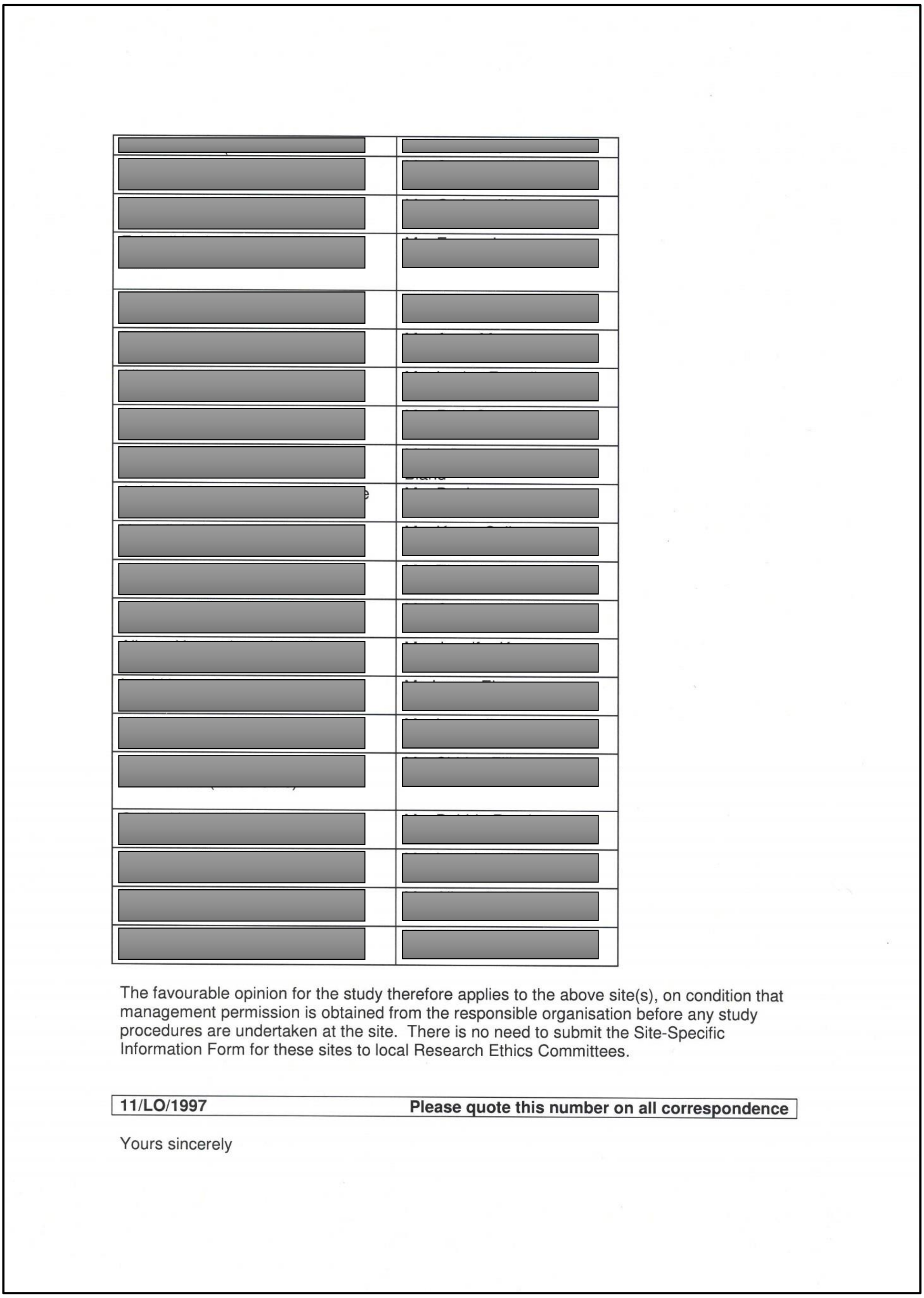
Request to exempt all non-NHS sites in a non-clinical study involving adults lacking capacity

The Committee agrees that all non-NHS sites in this study should be exempt from site-specific assessment (SSA). There is no need to submit the Site-Specific Information Form to any Research Ethics Committee.

The favourable opinion for the study applies to all sites involved in the research on condition that management permission is obtained from the host organisation at each site.

The Committee agrees that site-specific assessment is not required for the following subsidiary site(s):

Research site	*Name of PI or local contact point at the site*
University of East Anglia	Dr Lee Hooper
[redacted]	[redacted]
[redacted]	[redacted]



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The favourable opinion for the study therefore applies to the above site(s), on condition that management permission is obtained from the responsible organisation before any study procedures are undertaken at the site. There is no need to submit the Site-Specific Information Form for these sites to local Research Ethics Committees.

11/LO/1997	**Please quote this number on all correspondence**

Yours sincerely

L. Keegan

Laura Keegan
Committee Co-ordinator
E-mail: laura.keegan@nhs.net

Copy to: *Mrs Sue Steel*

Appendix 3: DRIE Participant Information Sheet

Recognising water-loss dehydration early in older people:
Participant information sheet

Your care home will be hosting new research that aims to develop a method to identify early dehydration in older people. This leaflet will tell you a little about the research, and what it will mean for you.

Water-loss dehydration – what is the problem?
Dehydration happens when we don't drink enough for our needs. It is bad for all of us. In older people severe dehydration increases confusion and falls, and makes sudden hospital admission more likely. We don't have a good method of recognising dehydration early, before it becomes severe. Being able to identify dehydration early would allow measures, such as extra encouragement with drinking, to prevent severe dehydration.

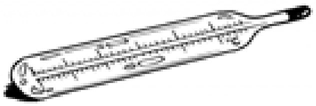
What is the study about?
The research will identify an easy method that can signal when someone needs to drink a bit more. We will do this by interviewing people living in care homes. Later, care home staff will be trained in how to recognise early water-loss dehydration.

Who will be involved in this research?
We will involve people living in care homes aged at least 65 years, who do not have heart failure or renal failure. Within your care home we will ask you and other people whether you would like to be part of the study. We will ask you to make this decision yourself if you can, allowing time for you to talk with friends, relatives and staff. If you cannot make this decision yourself we will ask your relative (consultee) whether you would want to participate if you could still make this decision yourself. Overall we will recruit 200 older people.

If I take part in the study, what will happen?
If you take part you will be asked to have some simple tests, answer some questions and give a blood sample (together taking up to 60 minutes). This will be followed up by a shorter second interview a year later (taking about 10 minutes). Both will be in a private area of the care home. Both times we will also ask your care home manager for information on your health, medications and how well you can carry out some tasks (like dressing).

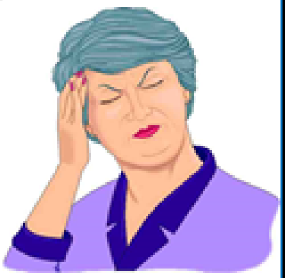
Why is the blood test needed?
The blood test is needed as we will use it to measure serum osmolality. This is the best way of assessing water-loss dehydration. This is the measure that the other tests will be compared to, when we see how well they work in identifying dehydration. The final method that we develop to identify water-loss dehydration will NOT include a blood test.

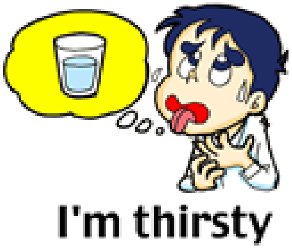
Who will know the results of my blood test?
The blood test results will be given to your care home manager and to your own GP, as well as the researchers.



What else will be assessed?
We will use a series of simple tests and questions. One is the squeeze test. We will check how quickly your flesh springs back after your hand is lightly squeezed. We will find out if this is a good indicator of dehydration. Other tests include:

- Looking at your tongue for dryness or furrows
- Body temperature
- Assessing how clearly you are thinking
- Change in your blood pressure and pulse on standing
- A tool which calculates body fluid (called BIA)
- Weight and height and recent weight change
- Feelings of thirst, tiredness, anxiety or being out-of-sorts
- Worries about getting to the toilet in time or getting up in the night
- Presence of a headache
- Urine colour and another urine test
- Your favourite drinks, and if you drink between meals
- Researchers will also watch to see what happens when you are offered a drink or want to go to the toilet.





Will any other information be recorded?
Yes, we will also gather some information from your care home manager. We will ask them about your ability to carry out tasks like dressing and going to the toilet, how active you are, current and recent health problems, and medications. We will ask your care home manager about your health and physical abilities again in 1 and 2 years time.

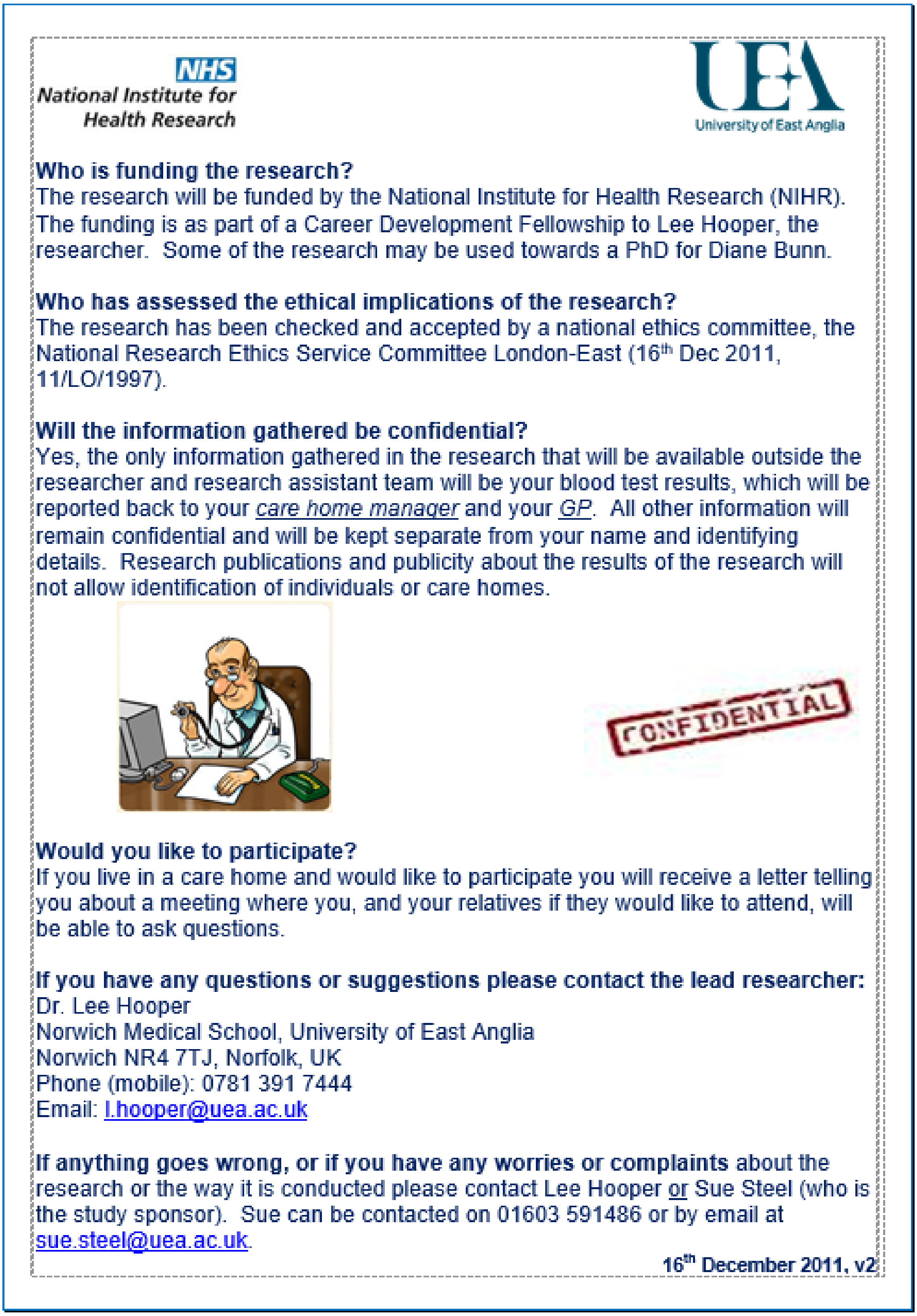
We will ask you about your, and your spouse's, jobs and previous postcode. If you do not remember this we will ask your care home manager.

If you agree, we will ask your care home to weigh you weekly for a year (though you can decide not to do this, and still be involved in the study if you like). After a year we will ask for a shorter meeting, to follow up your health and wellbeing.

What are the risks?
The blood test could be slightly painful, and could cause bleeding or bruising, though we will work to minimise this. When we ask you to stand up we will ensure that this is safe, supporting you if necessary, and will ask you to use any walking frame or sticks you would normally use.

Do I have to participate?
No, you should <u>only</u> participate if you really want to. If you decide not to participate you do not need to give a reason. If you decide not to participate there will be NO bad effects – it will not alter your care or support in your care home or with your GP.

What will I gain from involvement?
We hope you will enjoy the interview, and we aim to make it pleasant and friendly. If you participate you may also feel you are helping other older people as we learn to recognise dehydration. If you choose to participate you will receive a £10 voucher or equivalent gift for the first interview, and again for the second interview.



NHS
National Institute for Health Research

UEA
University of East Angliа

Who is funding the research?
The research will be funded by the National Institute for Health Research (NIHR). The funding is as part of a Career Development Fellowship to Lee Hooper, the researcher. Some of the research may be used towards a PhD for Diane Bunn.

Who has assessed the ethical implications of the research?
The research has been checked and accepted by a national ethics committee, the National Research Ethics Service Committee London-East (16th Dec 2011, 11/LO/1997).

Will the information gathered be confidential?
Yes, the only information gathered in the research that will be available outside the researcher and research assistant team will be your blood test results, which will be reported back to your *care home manager* and your *GP*. All other information will remain confidential and will be kept separate from your name and identifying details. Research publications and publicity about the results of the research will not allow identification of individuals or care homes.

CONFIDENTIAL

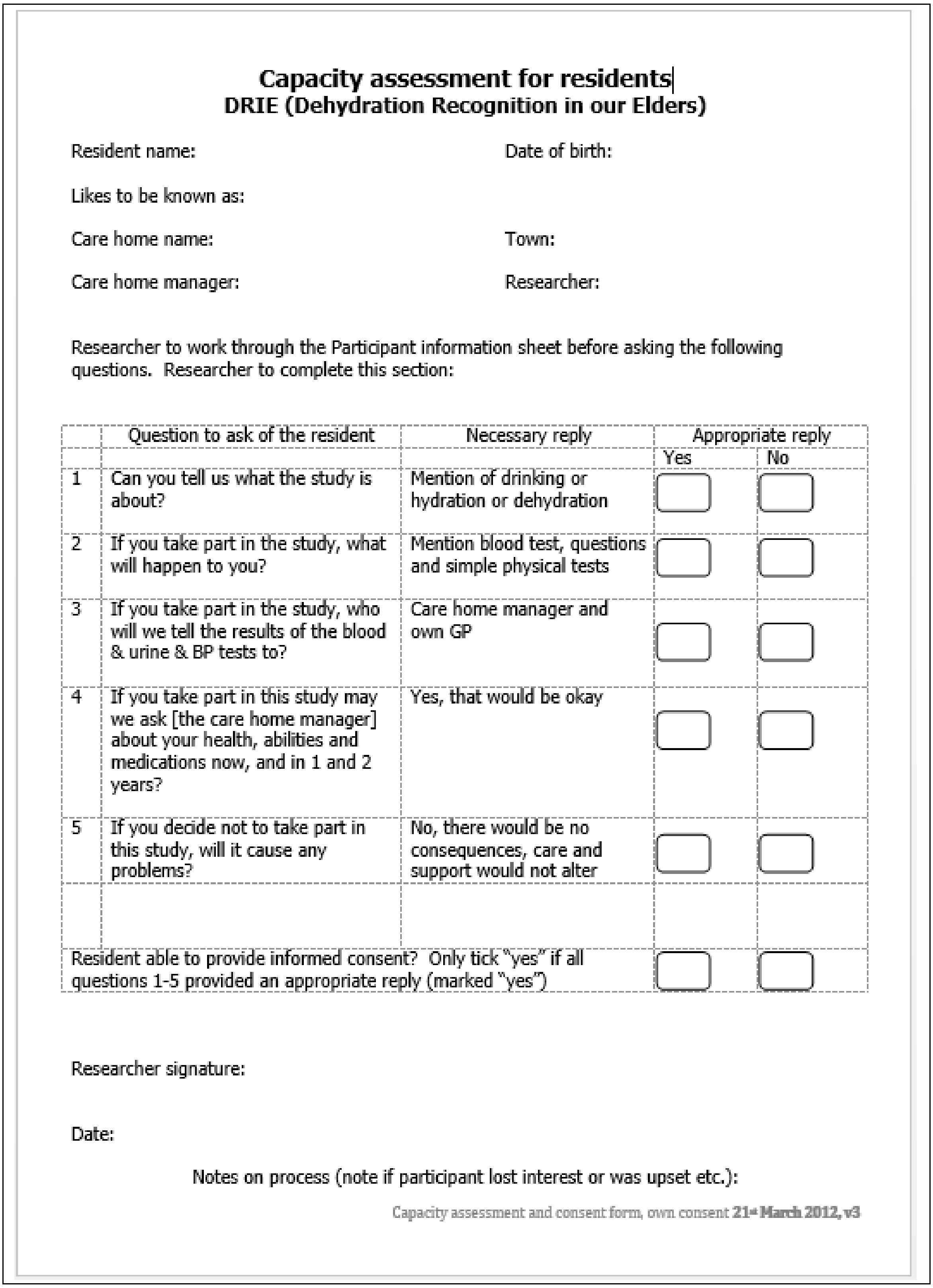
Would you like to participate?
If you live in a care home and would like to participate you will receive a letter telling you about a meeting where you, and your relatives if they would like to attend, will be able to ask questions.

If you have any questions or suggestions please contact the lead researcher:
Dr. Lee Hooper
Norwich Medical School, University of East Anglia
Norwich NR4 7TJ, Norfolk, UK
Phone (mobile): 0781 391 7444
Email: l.hooper@uea.ac.uk

If anything goes wrong, or if you have any worries or complaints about the research or the way it is conducted please contact Lee Hooper or Sue Steel (who is the study sponsor). Sue can be contacted on 01603 591486 or by email at sue.steel@uea.ac.uk.

16th December 2011, v2

Appendix 4: DRIE Capacity assessment



Capacity assessment for residents
DRIE (Dehydration Recognition in our Elders)

Resident name: Date of birth:

Likes to be known as:

Care home name: Town:

Care home manager: Researcher:

Researcher to work through the Participant information sheet before asking the following questions. Researcher to complete this section:

	Question to ask of the resident	Necessary reply	Appropriate reply	
			Yes	No
1	Can you tell us what the study is about?	Mention of drinking or hydration or dehydration	☐	☐
2	If you take part in the study, what will happen to you?	Mention blood test, questions and simple physical tests	☐	☐
3	If you take part in the study, who will we tell the results of the blood & urine & BP tests to?	Care home manager and own GP	☐	☐
4	If you take part in this study may we ask [the care home manager] about your health, abilities and medications now, and in 1 and 2 years?	Yes, that would be okay	☐	☐
5	If you decide not to take part in this study, will it cause any problems?	No, there would be no consequences, care and support would not alter	☐	☐
Resident able to provide informed consent? Only tick "yes" if all questions 1-5 provided an appropriate reply (marked "yes")			☐	☐

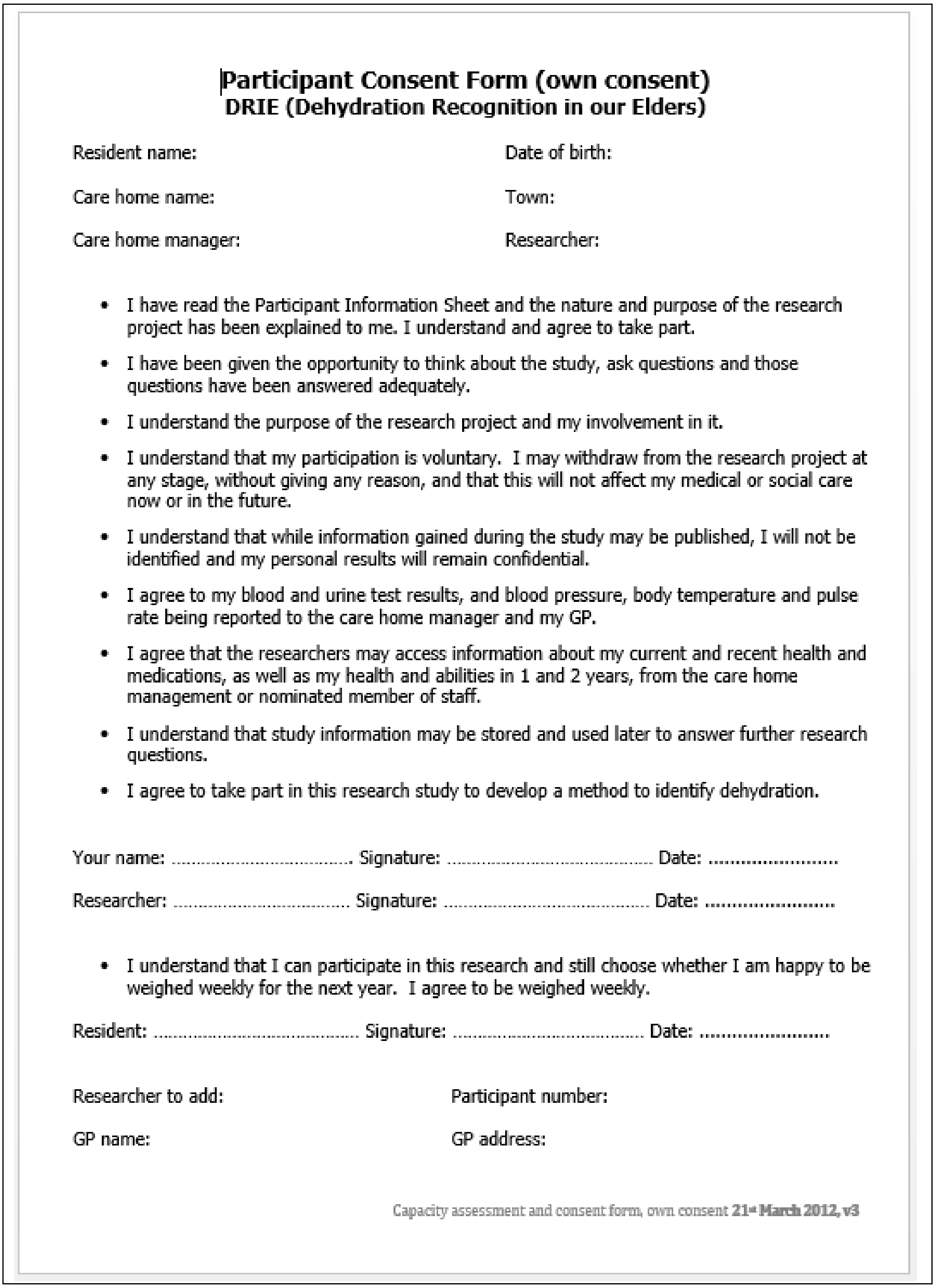
Researcher signature:

Date:

Notes on process (note if participant lost interest or was upset etc.):

Capacity assessment and consent form, own consent 21st March 2012, v3

Appendix 5: DRIE Consent Form



Participant Consent Form (own consent)
DRIE (Dehydration Recognition in our Elders)

Resident name:	Date of birth:
Care home name:	Town:
Care home manager:	Researcher:

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I have been given the opportunity to think about the study, ask questions and those questions have been answered adequately.
- I understand the purpose of the research project and my involvement in it.
- I understand that my participation is voluntary. I may withdraw from the research project at any stage, without giving any reason, and that this will not affect my medical or social care now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I agree to my blood and urine test results, and blood pressure, body temperature and pulse rate being reported to the care home manager and my GP.
- I agree that the researchers may access information about my current and recent health and medications, as well as my health and abilities in 1 and 2 years, from the care home management or nominated member of staff.
- I understand that study information may be stored and used later to answer further research questions.
- I agree to take part in this research study to develop a method to identify dehydration.

Your name: .... Signature: .... Date: ....

Researcher: .... Signature: .... Date: ....

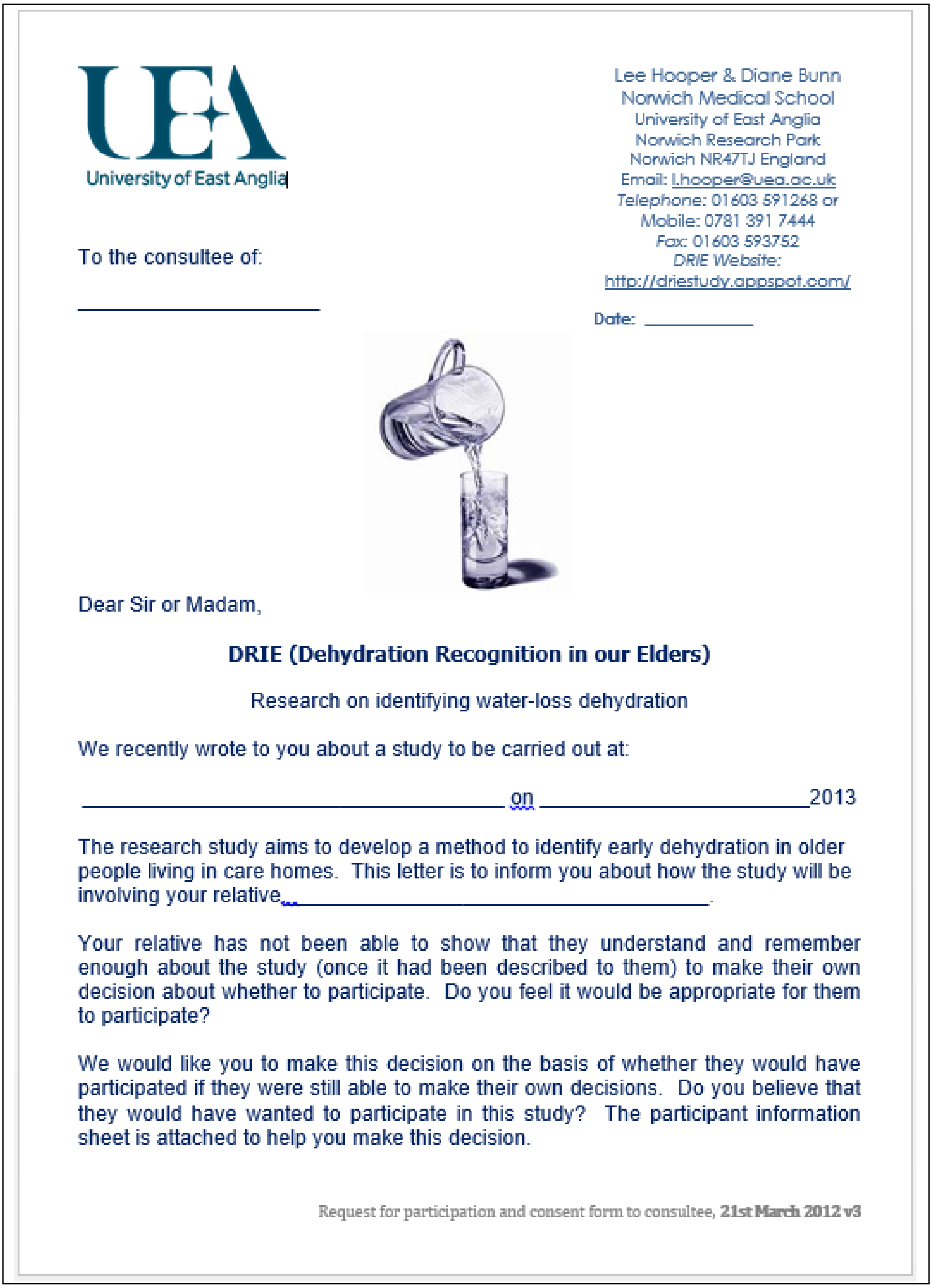
- I understand that I can participate in this research and still choose whether I am happy to be weighed weekly for the next year. I agree to be weighed weekly.

Resident: .... Signature: .... Date: ....

Researcher to add:	Participant number:
GP name:	GP address:

Capacity assessment and consent form, own consent **21st March 2012, v3**

Appendix 6: DRIE Consultee Declaration



Lee Hooper & Diane Bunn
Norwich Medical School
University of East Anglia
Norwich Research Park
Norwich NR47TJ England
Email: l.hooper@uea.ac.uk
Telephone: 01603 591268 or
Mobile: 0781 391 7444
Fax: 01603 593752
DRIE Website:
http://driestudy.appspot.com/

Date: ____________

To the consultee of:

____

Dear Sir or Madam,

DRIE (Dehydration Recognition in our Elders)

Research on identifying water-loss dehydration

We recently wrote to you about a study to be carried out at:

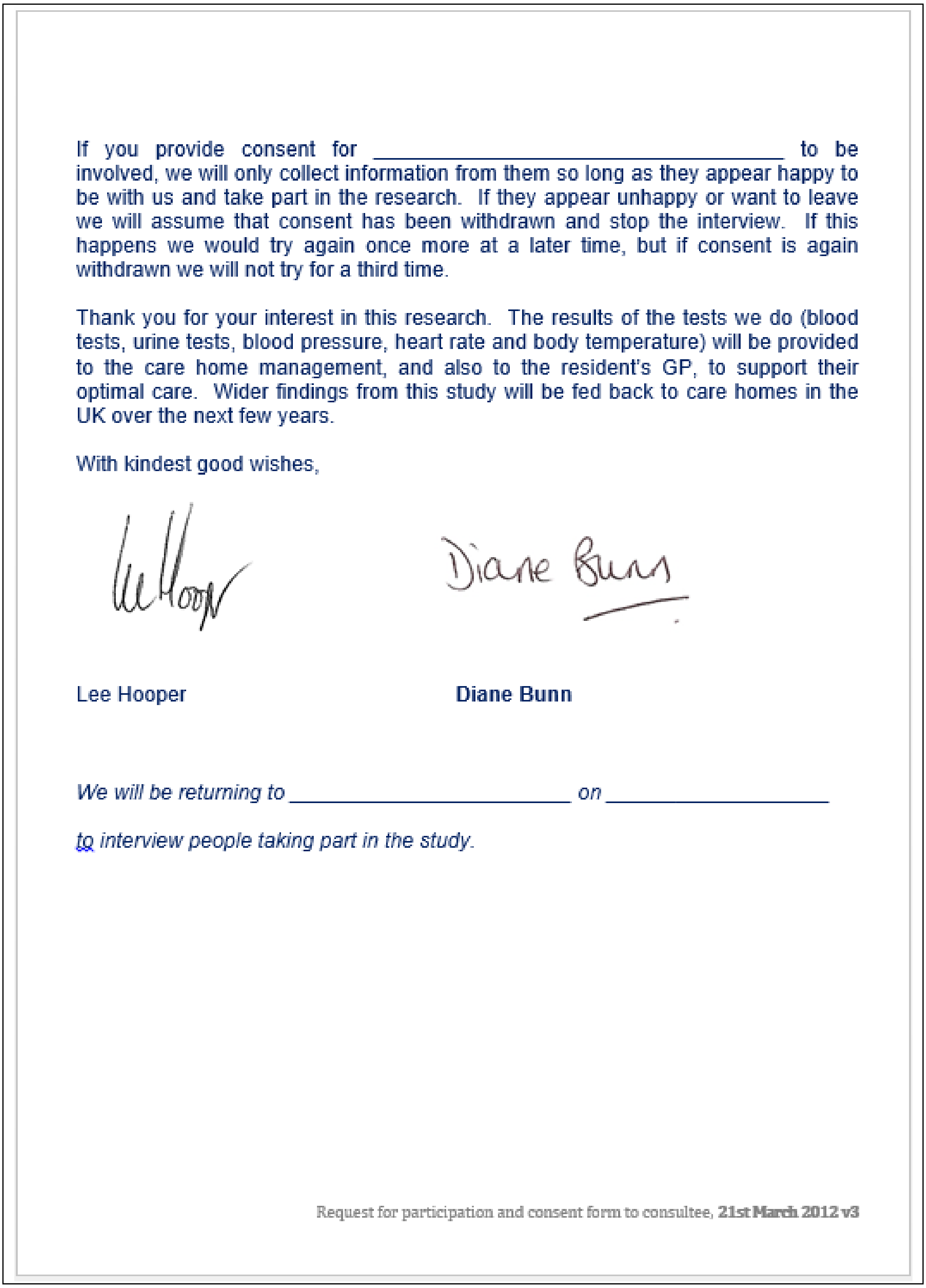
____ on ___________________________2013

The research study aims to develop a method to identify early dehydration in older people living in care homes. This letter is to inform you about how the study will be involving your relative____.

Your relative has not been able to show that they understand and remember enough about the study (once it had been described to them) to make their own decision about whether to participate. Do you feel it would be appropriate for them to participate?

We would like you to make this decision on the basis of whether they would have participated if they were still able to make their own decisions. Do you believe that they would have wanted to participate in this study? The participant information sheet is attached to help you make this decision.

Request for participation and consent form to consultee, **21st March 2012 v3**



If you provide consent for ______________________________ to be involved, we will only collect information from them so long as they appear happy to be with us and take part in the research. If they appear unhappy or want to leave we will assume that consent has been withdrawn and stop the interview. If this happens we would try again once more at a later time, but if consent is again withdrawn we will not try for a third time.

Thank you for your interest in this research. The results of the tests we do (blood tests, urine tests, blood pressure, heart rate and body temperature) will be provided to the care home management, and also to the resident's GP, to support their optimal care. Wider findings from this study will be fed back to care homes in the UK over the next few years.

With kindest good wishes,

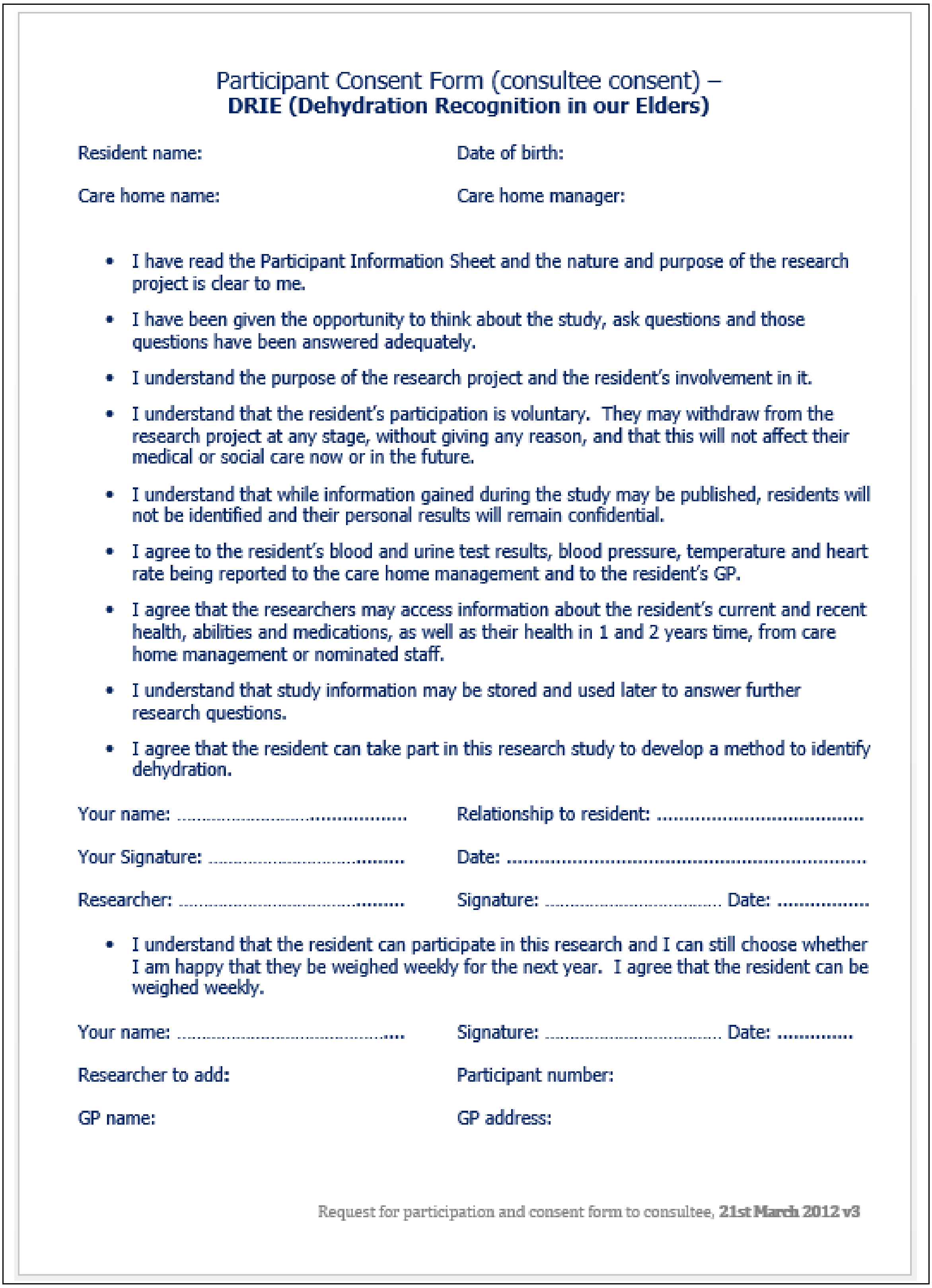
Diane Bunn

Lee Hooper **Diane Bunn**

We will be returning to ________________________ on ___________________

to interview people taking part in the study.

Request for participation and consent form to consultee, **21st March 2012 v3**



Participant Consent Form (consultee consent) – **DRIE (Dehydration Recognition in our Elders)**

Resident name: Date of birth:

Care home name: Care home manager:

- I have read the Participant Information Sheet and the nature and purpose of the research project is clear to me.
- I have been given the opportunity to think about the study, ask questions and those questions have been answered adequately.
- I understand the purpose of the research project and the resident's involvement in it.
- I understand that the resident's participation is voluntary. They may withdraw from the research project at any stage, without giving any reason, and that this will not affect their medical or social care now or in the future.
- I understand that while information gained during the study may be published, residents will not be identified and their personal results will remain confidential.
- I agree to the resident's blood and urine test results, blood pressure, temperature and heart rate being reported to the care home management and to the resident's GP.
- I agree that the researchers may access information about the resident's current and recent health, abilities and medications, as well as their health in 1 and 2 years time, from care home management or nominated staff.
- I understand that study information may be stored and used later to answer further research questions.
- I agree that the resident can take part in this research study to develop a method to identify dehydration.

Your name: ………………………………… Relationship to resident: …………………………………

Your Signature: ………………………………… Date: ……………………………………………………

Researcher: ………………………………… Signature: ……………………… Date: ……………

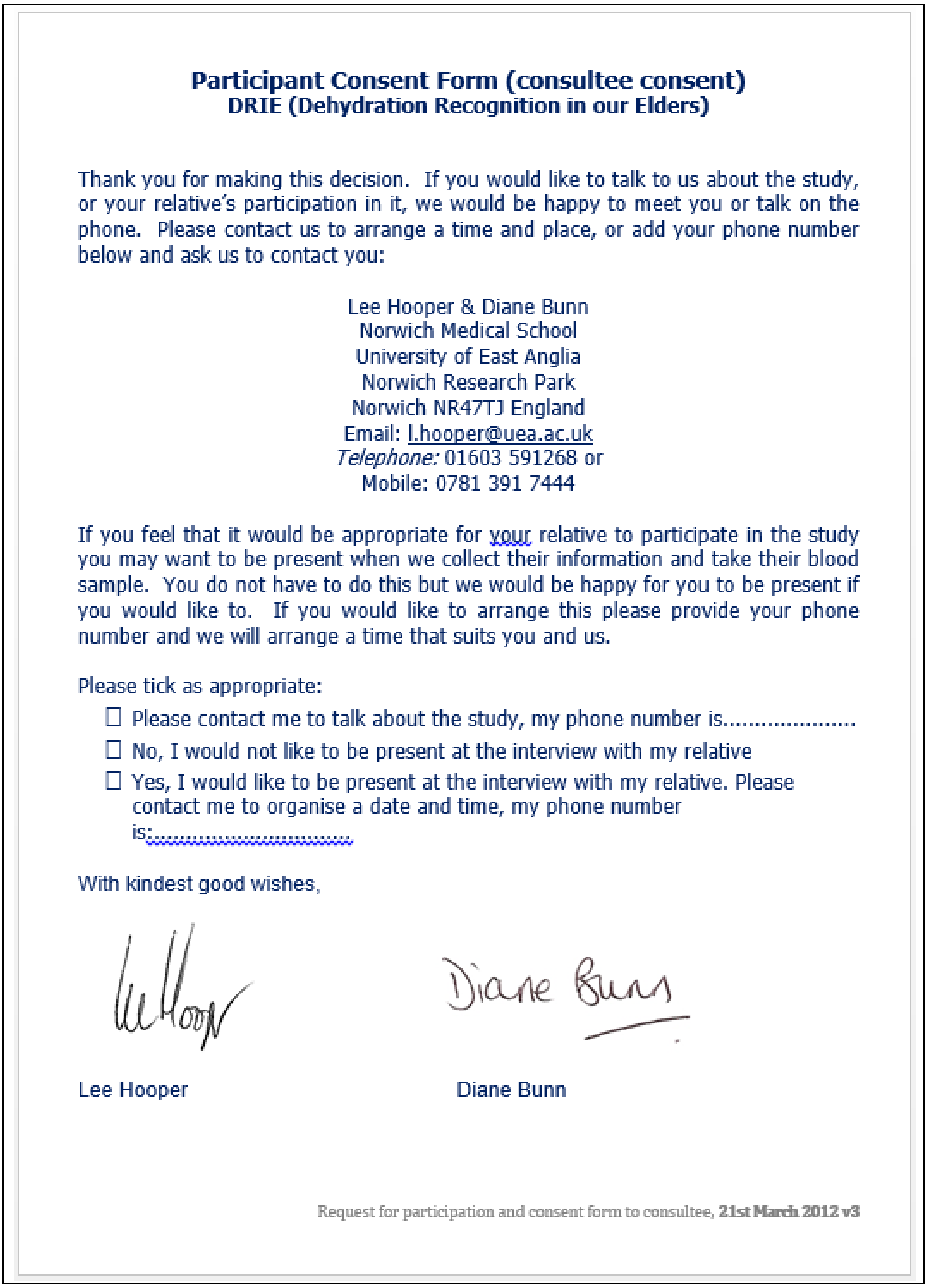
- I understand that the resident can participate in this research and I can still choose whether I am happy that they be weighed weekly for the next year. I agree that the resident can be weighed weekly.

Your name: ………………………………… Signature: ……………………… Date: …………

Researcher to add: Participant number:

GP name: GP address:

Request for participation and consent form to consultee, **21st March 2012 v3**



Participant Consent Form (consultee consent)

DRIE (Dehydration Recognition in our Elders)

Thank you for making this decision. If you would like to talk to us about the study, or your relative's participation in it, we would be happy to meet you or talk on the phone. Please contact us to arrange a time and place, or add your phone number below and ask us to contact you:

Lee Hooper & Diane Bunn
Norwich Medical School
University of East Anglia
Norwich Research Park
Norwich NR47TJ England
Email: l.hooper@uea.ac.uk
Telephone: 01603 591268 or
Mobile: 0781 391 7444

If you feel that it would be appropriate for your relative to participate in the study you may want to be present when we collect their information and take their blood sample. You do not have to do this but we would be happy for you to be present if you would like to. If you would like to arrange this please provide your phone number and we will arrange a time that suits you and us.

Please tick as appropriate:

- ☐ Please contact me to talk about the study, my phone number is....................
- ☐ No, I would not like to be present at the interview with my relative
- ☐ Yes, I would like to be present at the interview with my relative. Please contact me to organise a date and time, my phone number is:..............................

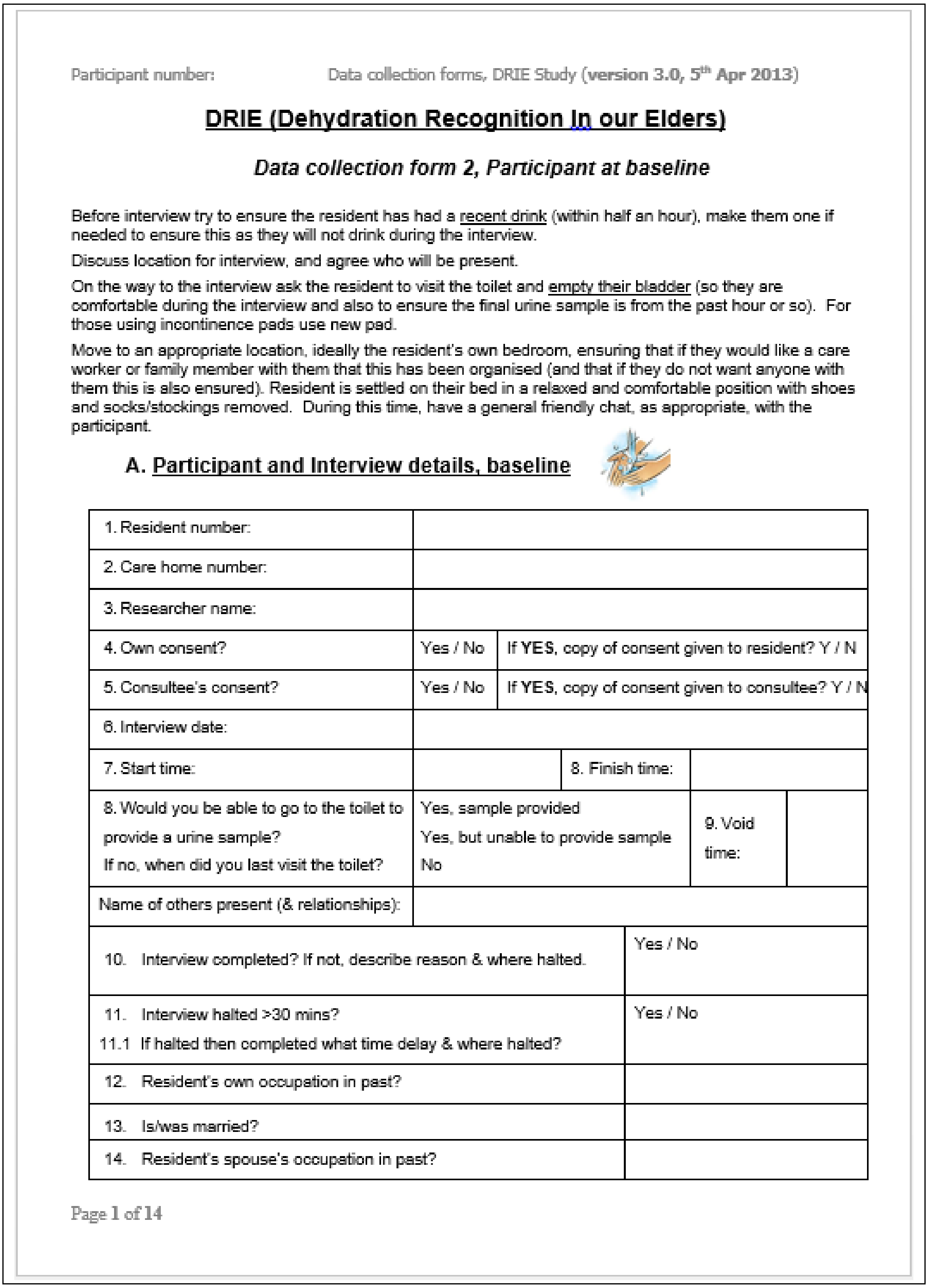
With kindest good wishes,

LeeHooper Diane Bunn

Lee Hooper Diane Bunn

Request for participation and consent form to consultee, **21st March 2012 v3**

Appendix 7: DRIE Resident Interview Questionnaire



Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

DRIE (Dehydration Recognition In our Elders)

Data collection form 2, Participant at baseline

Before interview try to ensure the resident has had a recent drink (within half an hour), make them one if needed to ensure this as they will not drink during the interview.

Discuss location for interview, and agree who will be present.

On the way to the interview ask the resident to visit the toilet and empty their bladder (so they are comfortable during the interview and also to ensure the final urine sample is from the past hour or so). For those using incontinence pads use new pad.

Move to an appropriate location, ideally the resident's own bedroom, ensuring that if they would like a care worker or family member with them that this has been organised (and that if they do not want anyone with them this is also ensured). Resident is settled on their bed in a relaxed and comfortable position with shoes and socks/stockings removed. During this time, have a general friendly chat, as appropriate, with the participant.

A. Participant and Interview details, baseline

1. Resident number:			
2. Care home number:			
3. Researcher name:			
4. Own consent?	Yes / No	If **YES**, copy of consent given to resident? Y / N	
5. Consultee's consent?	Yes / No	If **YES**, copy of consent given to consultee? Y / N	
6. Interview date:			
7. Start time:		8. Finish time:	
8. Would you be able to go to the toilet to provide a urine sample? If no, when did you last visit the toilet?	Yes, sample provided Yes, but unable to provide sample No	9. Void time:	
Name of others present (& relationships):			
10. Interview completed? If not, describe reason & where halted.	Yes / No		
11. Interview halted >30 mins? 11.1 If halted then completed what time delay & where halted?	Yes / No		
12. Resident's own occupation in past?			
13. Is/was married?			
14. Resident's spouse's occupation in past?			

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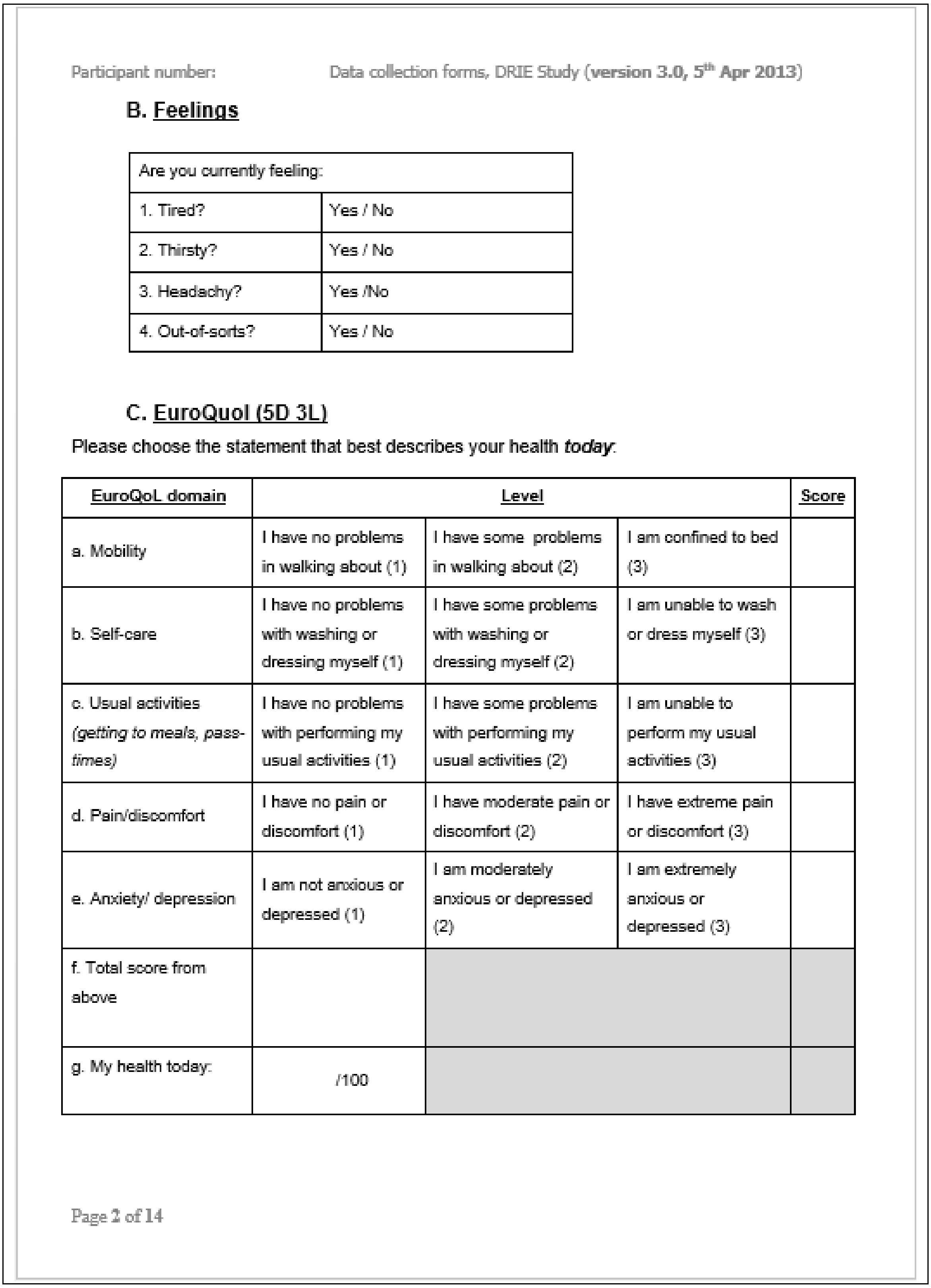

Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

B. Feelings

Are you currently feeling:	
1. Tired?	Yes / No
2. Thirsty?	Yes / No
3. Headachy?	Yes /No
4. Out-of-sorts?	Yes / No

C. EuroQuol (5D 3L)

Please choose the statement that best describes your health ***today***:

EuroQoL domain	Level			Score
a. Mobility	I have no problems in walking about (1)	I have some problems in walking about (2)	I am confined to bed (3)	
b. Self-care	I have no problems with washing or dressing myself (1)	I have some problems with washing or dressing myself (2)	I am unable to wash or dress myself (3)	
c. Usual activities *(getting to meals, pass-times)*	I have no problems with performing my usual activities (1)	I have some problems with performing my usual activities (2)	I am unable to perform my usual activities (3)	
d. Pain/discomfort	I have no pain or discomfort (1)	I have moderate pain or discomfort (2)	I have extreme pain or discomfort (3)	
e. Anxiety/ depression	I am not anxious or depressed (1)	I am moderately anxious or depressed (2)	I am extremely anxious or depressed (3)	
f. Total score from above				
g. My health today:	/100			

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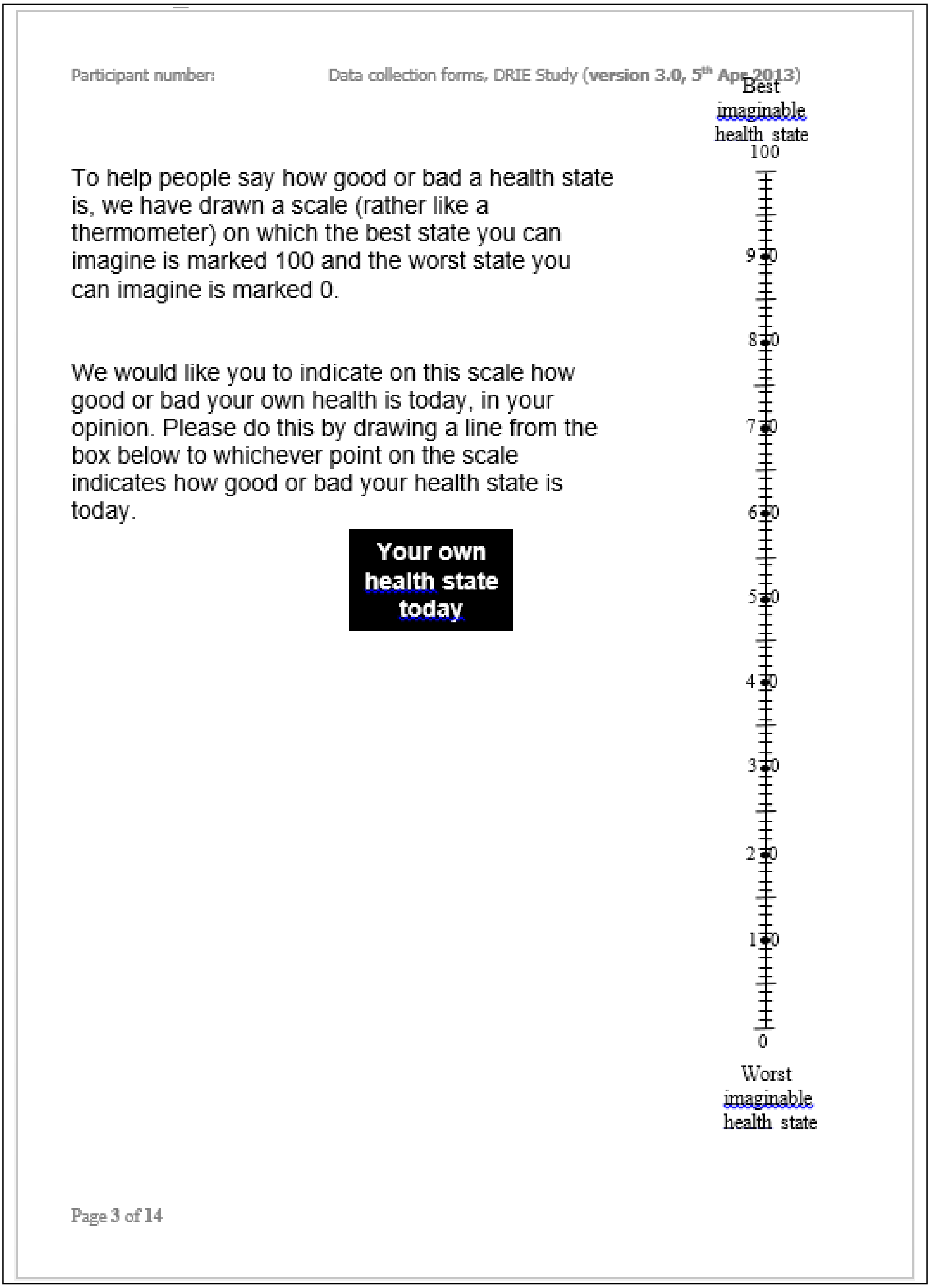
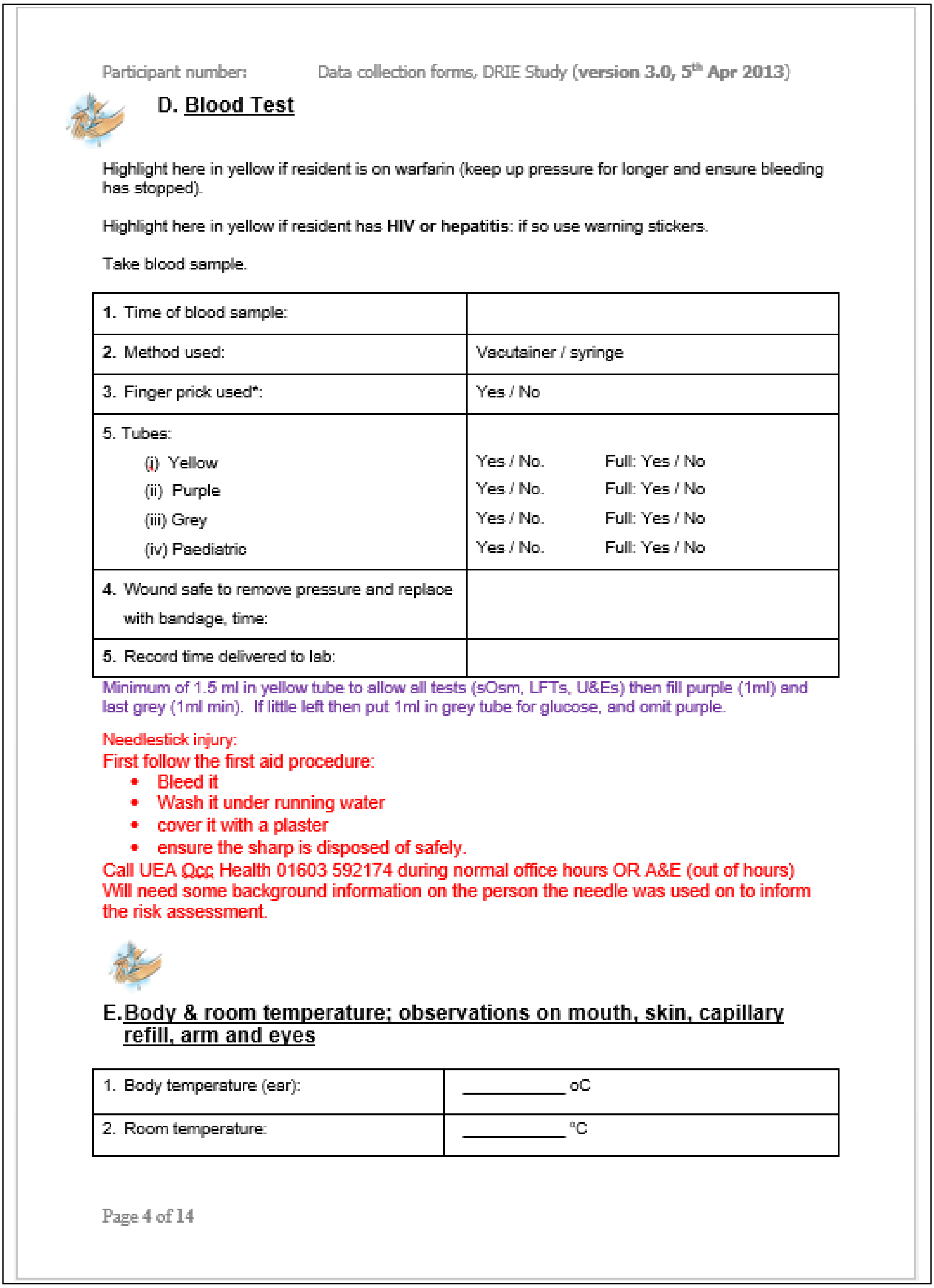


To help people say how good or bad a health state is, we have drawn a scale (rather like a thermometer) on which the best state you can imagine is marked 100 and the worst state you can imagine is marked 0.

We would like you to indicate on this scale how good or bad your own health is today, in your opinion. Please do this by drawing a line from the box below to whichever point on the scale indicates how good or bad your health state is today.

Your own health state today



Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

D. Blood Test

Highlight here in yellow if resident is on warfarin (keep up pressure for longer and ensure bleeding has stopped).

Highlight here in yellow if resident has **HIV or hepatitis**: if so use warning stickers.

Take blood sample.

1. Time of blood sample:		
2. Method used:	Vacutainer / syringe	
3. Finger prick used*:	Yes / No	
5. Tubes: (i) Yellow (ii) Purple (iii) Grey (iv) Paediatric	 Yes / No. Yes / No. Yes / No. Yes / No.	 Full: Yes / No Full: Yes / No Full: Yes / No Full: Yes / No
4. Wound safe to remove pressure and replace with bandage, time:		
5. Record time delivered to lab:		

Minimum of 1.5 ml in yellow tube to allow all tests (sOsm, LFTs, U&Es) then fill purple (1ml) and last grey (1ml min). If little left then put 1ml in grey tube for glucose, and omit purple.

Needlestick injury:

First follow the first aid procedure:

- Bleed it
- Wash it under running water
- cover it with a plaster
- ensure the sharp is disposed of safely.

Call UEA Occ Health 01603 592174 during normal office hours OR A&E (out of hours)
Will need some background information on the person the needle was used on to inform the risk assessment.

E. Body & room temperature; observations on mouth, skin, capillary refill, arm and eyes

1. Body temperature (ear):	___________ oC
2. Room temperature:	___________ °C

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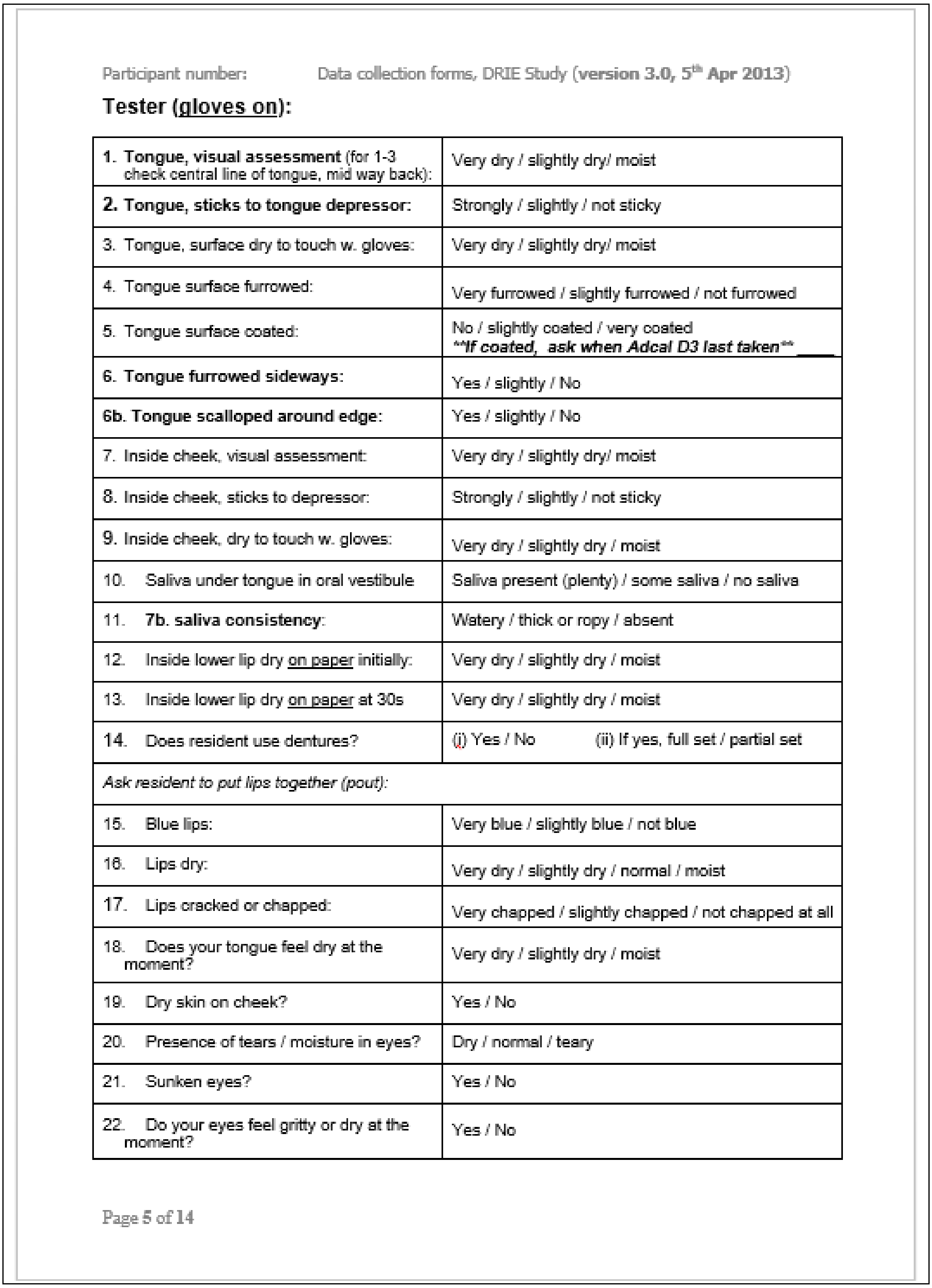

Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

Tester (<u>gloves on</u>):

1. **Tongue, visual assessment** (for 1-3 check central line of tongue, mid way back):	Very dry / slightly dry/ moist
2. **Tongue, sticks to tongue depressor:**	Strongly / slightly / not sticky
3. Tongue, surface dry to touch w. gloves:	Very dry / slightly dry/ moist
4. Tongue surface furrowed:	Very furrowed / slightly furrowed / not furrowed
5. Tongue surface coated:	No / slightly coated / very coated _**If coated, ask when Adcal D3 last taken**_ ____
6. **Tongue furrowed sideways:**	Yes / slightly / No
6b. Tongue scalloped around edge:	Yes / slightly / No
7. Inside cheek, visual assessment:	Very dry / slightly dry/ moist
8. Inside cheek, sticks to depressor:	Strongly / slightly / not sticky
9. Inside cheek, dry to touch w. gloves:	Very dry / slightly dry / moist
10. Saliva under tongue in oral vestibule	Saliva present (plenty) / some saliva / no saliva
11. **7b. saliva consistency**:	Watery / thick or ropy / absent
12. Inside lower lip dry <u>on paper</u> initially:	Very dry / slightly dry / moist
13. Inside lower lip dry <u>on paper</u> at 30s	Very dry / slightly dry / moist
14. Does resident use dentures?	(i) Yes / No (ii) If yes, full set / partial set
Ask resident to put lips together (pout):	
15. Blue lips:	Very blue / slightly blue / not blue
16. Lips dry:	Very dry / slightly dry / normal / moist
17. Lips cracked or chapped:	Very chapped / slightly chapped / not chapped at all
18. Does your tongue feel dry at the moment?	Very dry / slightly dry / moist
19. Dry skin on cheek?	Yes / No
20. Presence of tears / moisture in eyes?	Dry / normal / teary
21. Sunken eyes?	Yes / No
22. Do your eyes feel gritty or dry at the moment?	Yes / No

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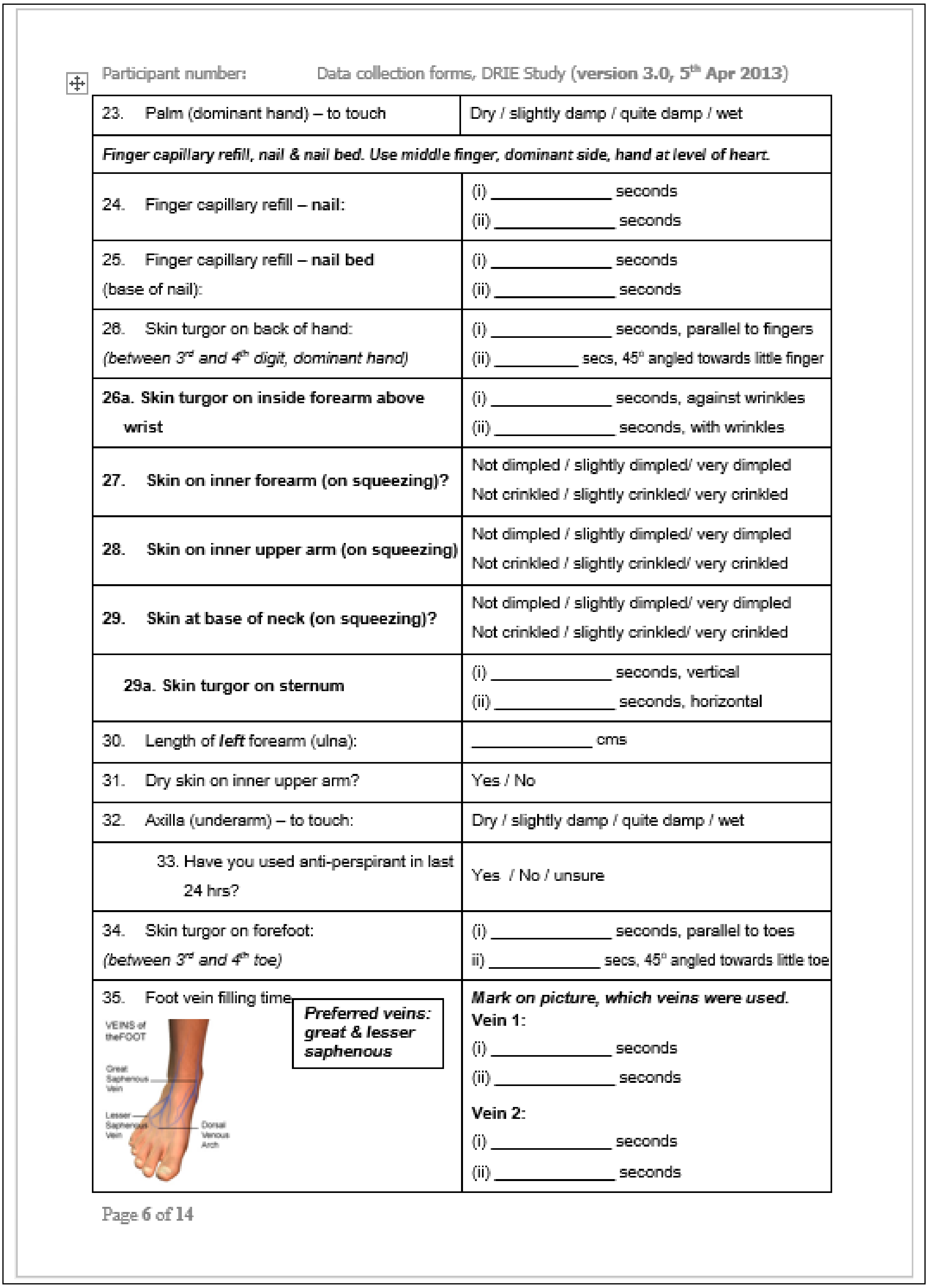

Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

23. Palm (dominant hand) – to touch	Dry / slightly damp / quite damp / wet
Finger capillary refill, nail & nail bed. Use middle finger, dominant side, hand at level of heart.	
24. Finger capillary refill – nail:	(i) __________ seconds (ii) __________ seconds
25. Finger capillary refill – nail bed (base of nail):	(i) __________ seconds (ii) __________ seconds
26. Skin turgor on back of hand: *(between 3rd and 4th digit, dominant hand)*	(i) __________ seconds, parallel to fingers (ii) ________ secs, 45° angled towards little finger
26a. Skin turgor on inside forearm above wrist	(i) __________ seconds, against wrinkles (ii) __________ seconds, with wrinkles
27. Skin on inner forearm (on squeezing)?	Not dimpled / slightly dimpled/ very dimpled Not crinkled / slightly crinkled/ very crinkled
28. Skin on inner upper arm (on squeezing)	Not dimpled / slightly dimpled/ very dimpled Not crinkled / slightly crinkled/ very crinkled
29. Skin at base of neck (on squeezing)?	Not dimpled / slightly dimpled/ very dimpled Not crinkled / slightly crinkled/ very crinkled
29a. Skin turgor on sternum	(i) __________ seconds, vertical (ii) __________ seconds, horizontal
30. Length of *left* forearm (ulna):	__________ cms
31. Dry skin on inner upper arm?	Yes / No
32. Axilla (underarm) – to touch:	Dry / slightly damp / quite damp / wet
33. Have you used anti-perspirant in last 24 hrs?	Yes / No / unsure
34. Skin turgor on forefoot: *(between 3rd and 4th toe)*	(i) __________ seconds, parallel to toes ii) __________ secs, 45° angled towards little toe
35. Foot vein filling time ***Preferred veins: great & lesser saphenous***	***Mark on picture, which veins were used.*** **Vein 1:** (i) __________ seconds (ii) __________ seconds **Vein 2:** (i) __________ seconds (ii) __________ seconds

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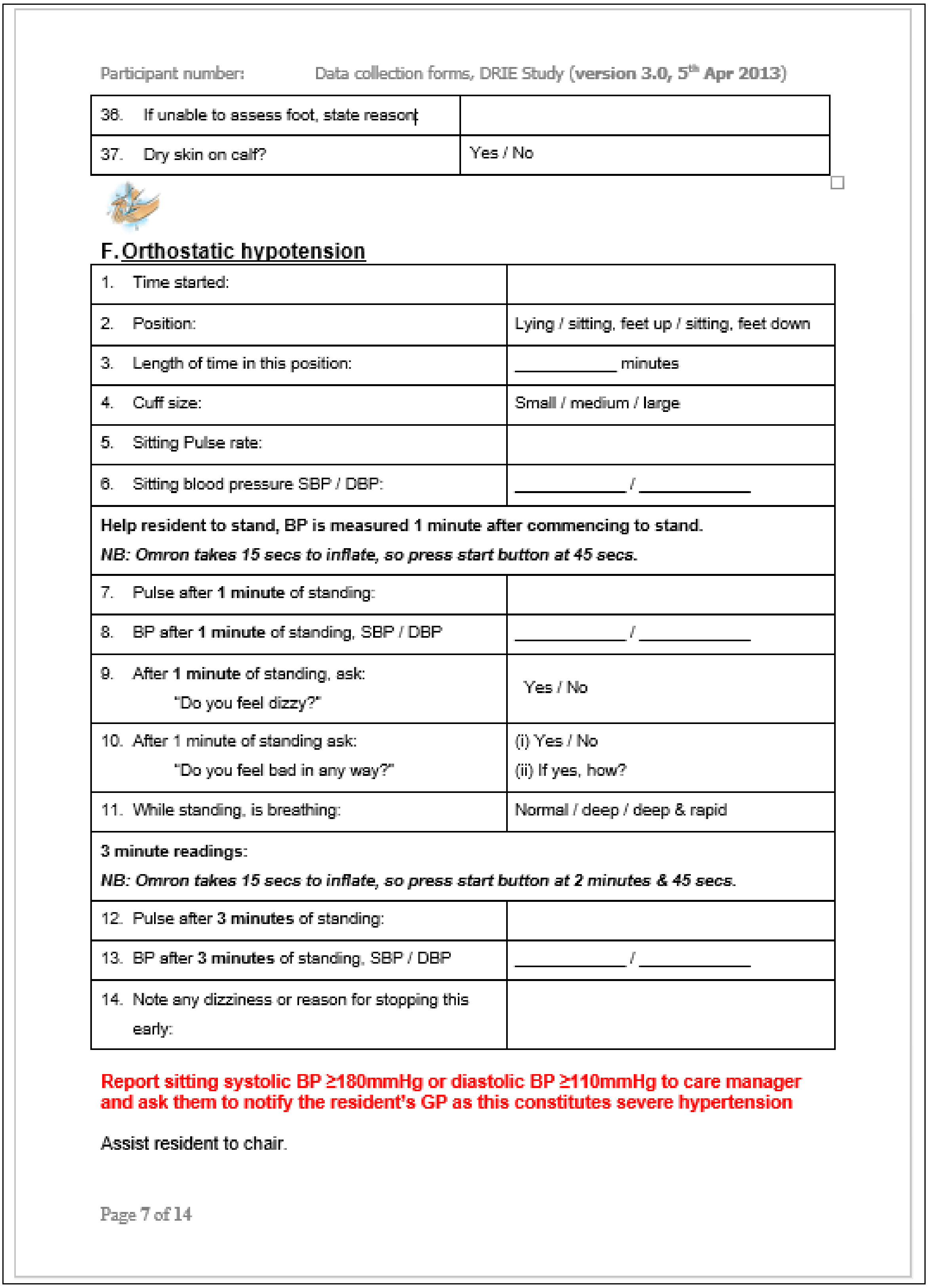

Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

36. If unable to assess foot, state reason	
37. Dry skin on calf?	Yes / No

F. Orthostatic hypotension

1. Time started:	
2. Position:	Lying / sitting, feet up / sitting, feet down
3. Length of time in this position:	___________ minutes
4. Cuff size:	Small / medium / large
5. Sitting Pulse rate:	
6. Sitting blood pressure SBP / DBP:	____________ / ____________
Help resident to stand, BP is measured 1 minute after commencing to stand. ***NB: Omron takes 15 secs to inflate, so press start button at 45 secs.***	
7. Pulse after **1 minute** of standing:	
8. BP after **1 minute** of standing, SBP / DBP	____________ / ____________
9. After **1 minute** of standing, ask: "Do you feel dizzy?"	Yes / No
10. After 1 minute of standing ask: "Do you feel bad in any way?"	(i) Yes / No (ii) If yes, how?
11. While standing, is breathing:	Normal / deep / deep & rapid
3 minute readings: ***NB: Omron takes 15 secs to inflate, so press start button at 2 minutes & 45 secs.***	
12. Pulse after **3 minutes** of standing:	
13. BP after **3 minutes** of standing, SBP / DBP	____________ / ____________
14. Note any dizziness or reason for stopping this early:	

Report sitting systolic BP ≥180mmHg or diastolic BP ≥110mmHg to care manager and ask them to notify the resident's GP as this constitutes severe hypertension

Assist resident to chair.

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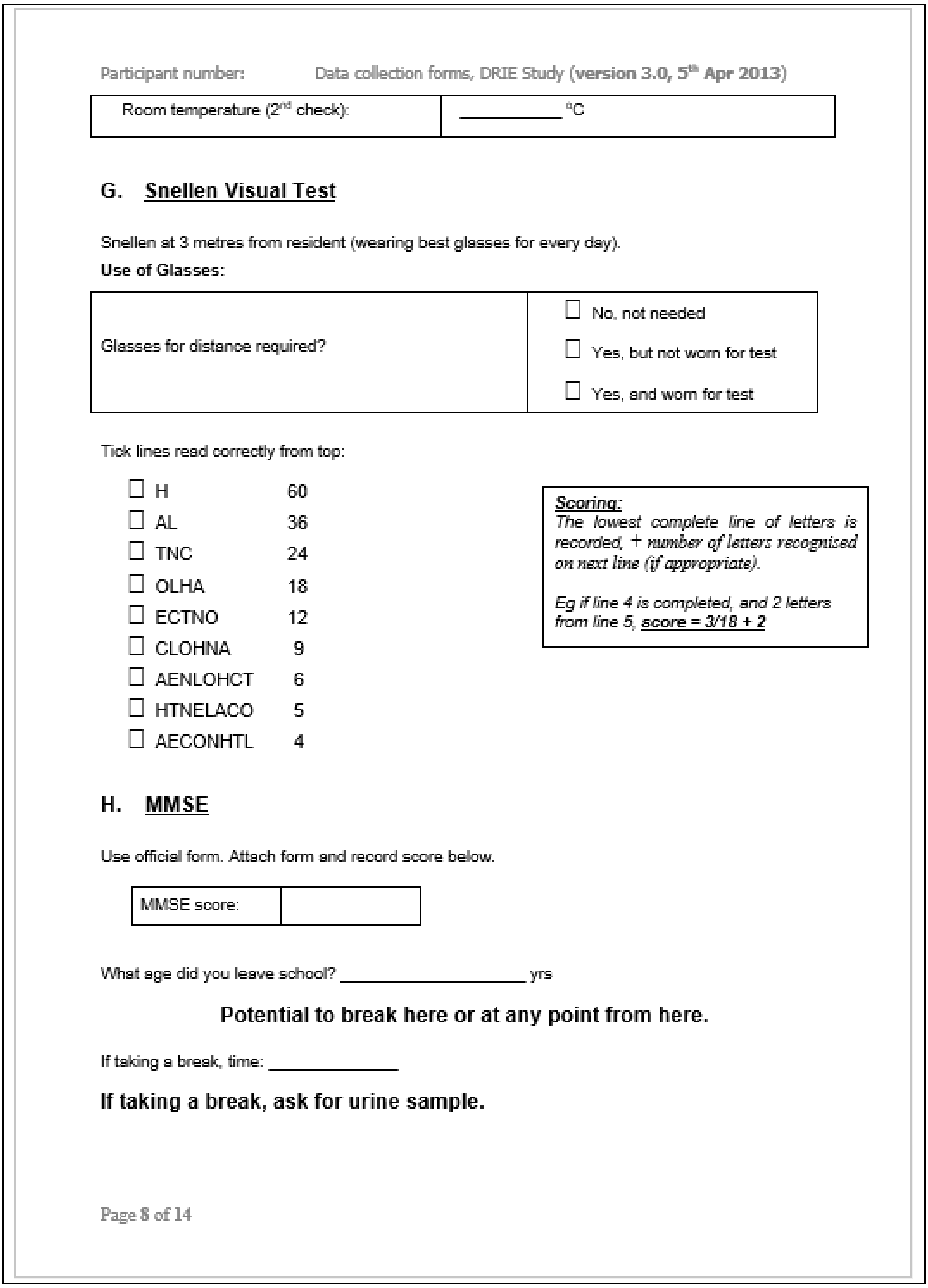


Room temperature (2nd check):	___________ °C

G. Snellen Visual Test

Snellen at 3 metres from resident (wearing best glasses for every day).

Use of Glasses:

Glasses for distance required?	☐ No, not needed ☐ Yes, but not worn for test ☐ Yes, and worn for test

Tick lines read correctly from top:

☐ H	60
☐ AL	36
☐ TNC	24
☐ OLHA	18
☐ ECTNO	12
☐ CLOHNA	9
☐ AENLOHCT	6
☐ HTNELACO	5
☐ AECONHTL	4

Scoring:
The lowest complete line of letters is recorded, + number of letters recognised on next line (if appropriate).

*Eg if line 4 is completed, and 2 letters from line 5, **score = 3/18 + 2***

H. MMSE

Use official form. Attach form and record score below.

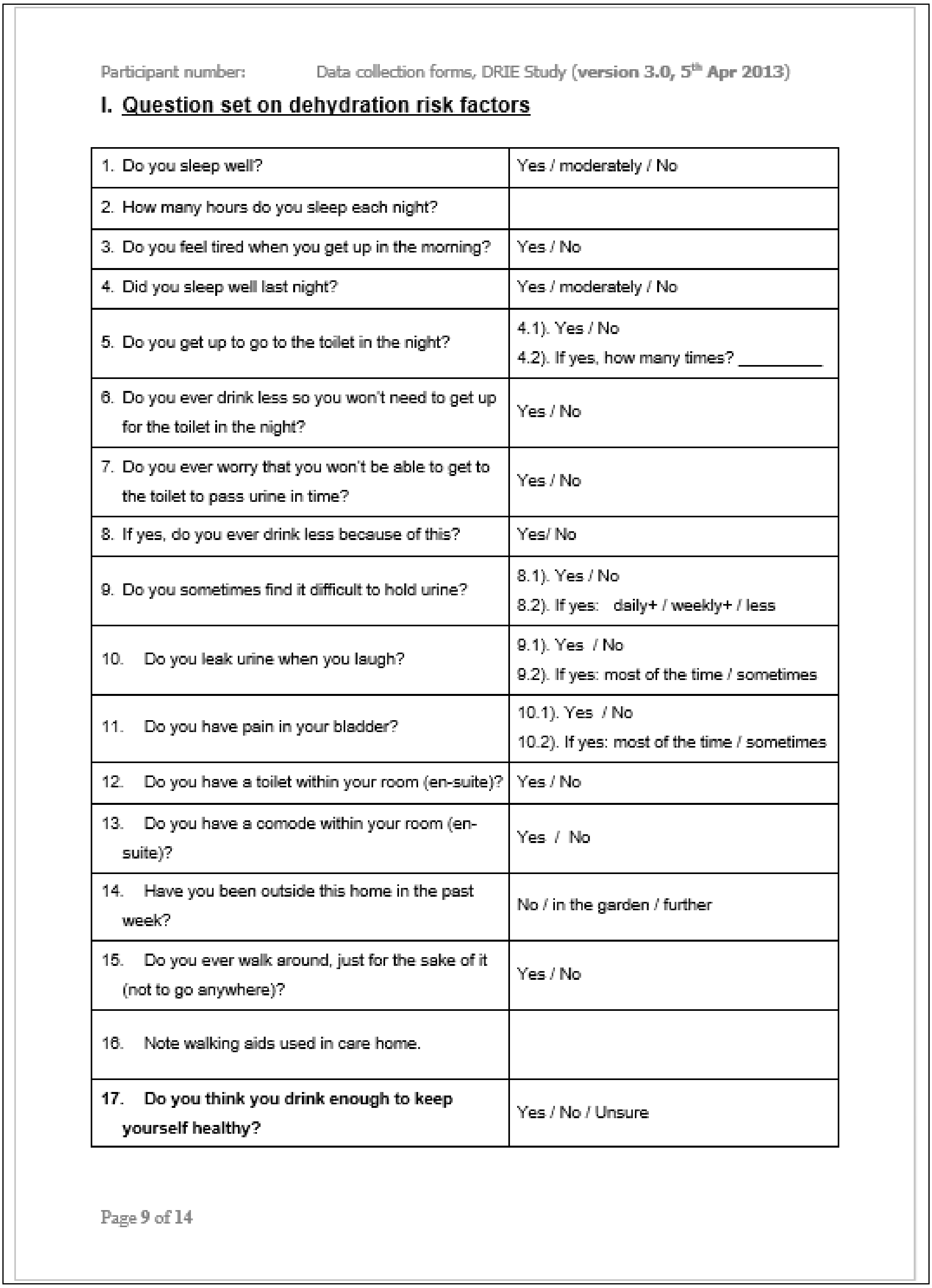
MMSE score:	

What age did you leave school? ____________________ yrs

Potential to break here or at any point from here.

If taking a break, time: ______________

If taking a break, ask for urine sample.

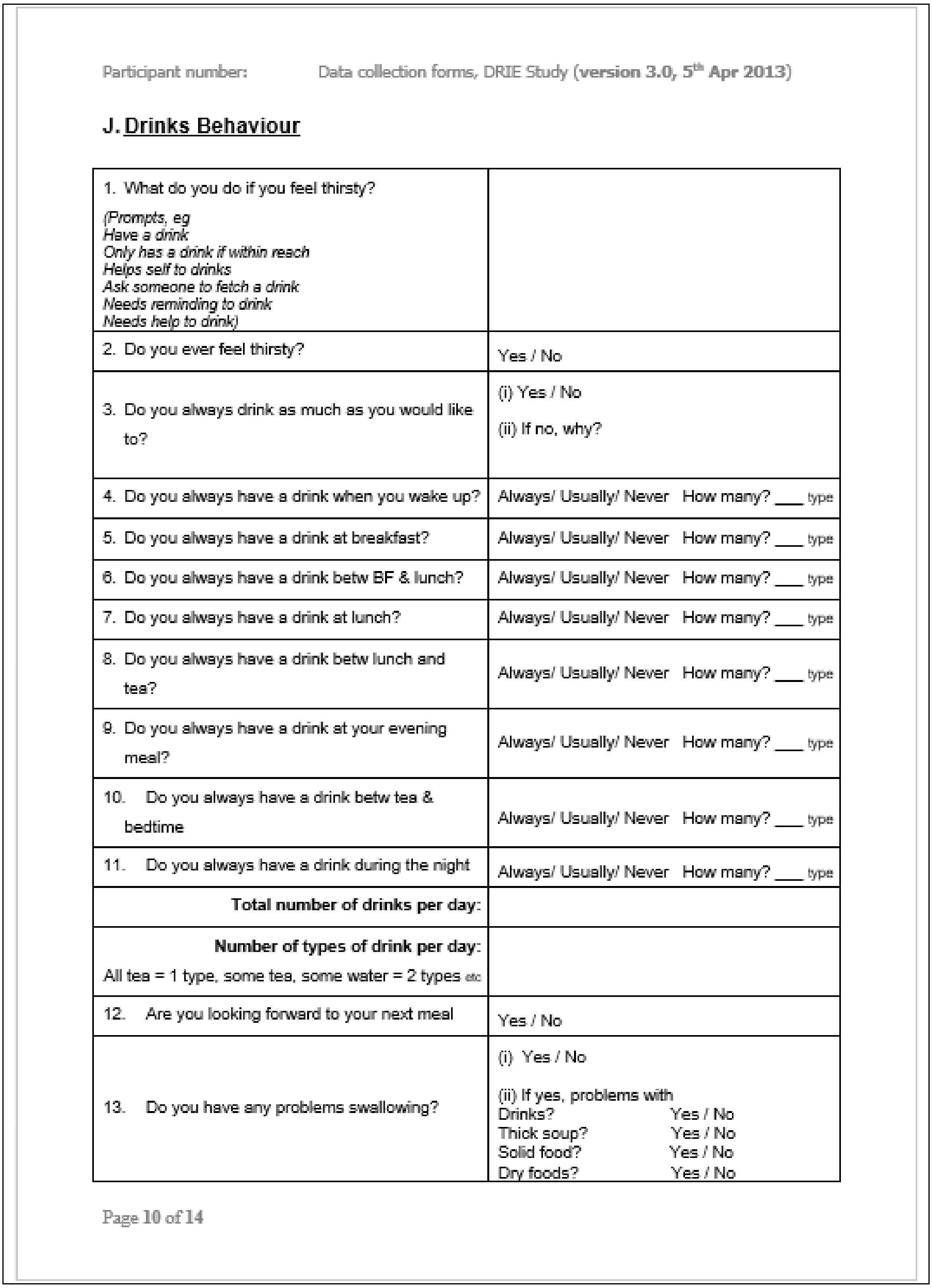


Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

I. Question set on dehydration risk factors

1. Do you sleep well?	Yes / moderately / No
2. How many hours do you sleep each night?	
3. Do you feel tired when you get up in the morning?	Yes / No
4. Did you sleep well last night?	Yes / moderately / No
5. Do you get up to go to the toilet in the night?	4.1). Yes / No 4.2). If yes, how many times? __________
6. Do you ever drink less so you won't need to get up for the toilet in the night?	Yes / No
7. Do you ever worry that you won't be able to get to the toilet to pass urine in time?	Yes / No
8. If yes, do you ever drink less because of this?	Yes/ No
9. Do you sometimes find it difficult to hold urine?	8.1). Yes / No 8.2). If yes: daily+ / weekly+ / less
10. Do you leak urine when you laugh?	9.1). Yes / No 9.2). If yes: most of the time / sometimes
11. Do you have pain in your bladder?	10.1). Yes / No 10.2). If yes: most of the time / sometimes
12. Do you have a toilet within your room (en-suite)?	Yes / No
13. Do you have a comode within your room (en-suite)?	Yes / No
14. Have you been outside this home in the past week?	No / in the garden / further
15. Do you ever walk around, just for the sake of it (not to go anywhere)?	Yes / No
16. Note walking aids used in care home.	
17. Do you think you drink enough to keep yourself healthy?	Yes / No / Unsure

Page **9** of **14**



Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

J. Drinks Behaviour

1. What do you do if you feel thirsty? *(Prompts, eg* *Have a drink* *Only has a drink if within reach* *Helps self to drinks* *Ask someone to fetch a drink* *Needs reminding to drink* *Needs help to drink)*	
2. Do you ever feel thirsty?	Yes / No
3. Do you always drink as much as you would like to?	(i) Yes / No (ii) If no, why?
4. Do you always have a drink when you wake up?	Always/ Usually/ Never How many? ___ type
5. Do you always have a drink at breakfast?	Always/ Usually/ Never How many? ___ type
6. Do you always have a drink betw BF & lunch?	Always/ Usually/ Never How many? ___ type
7. Do you always have a drink at lunch?	Always/ Usually/ Never How many? ___ type
8. Do you always have a drink betw lunch and tea?	Always/ Usually/ Never How many? ___ type
9. Do you always have a drink at your evening meal?	Always/ Usually/ Never How many? ___ type
10. Do you always have a drink betw tea & bedtime	Always/ Usually/ Never How many? ___ type
11. Do you always have a drink during the night	Always/ Usually/ Never How many? ___ type
Total number of drinks per day:	
Number of types of drink per day: All tea = 1 type, some tea, some water = 2 types etc	
12. Are you looking forward to your next meal	Yes / No
13. Do you have any problems swallowing?	(i) Yes / No (ii) If yes, problems with Drinks? Yes / No Thick soup? Yes / No Solid food? Yes / No Dry foods? Yes / No

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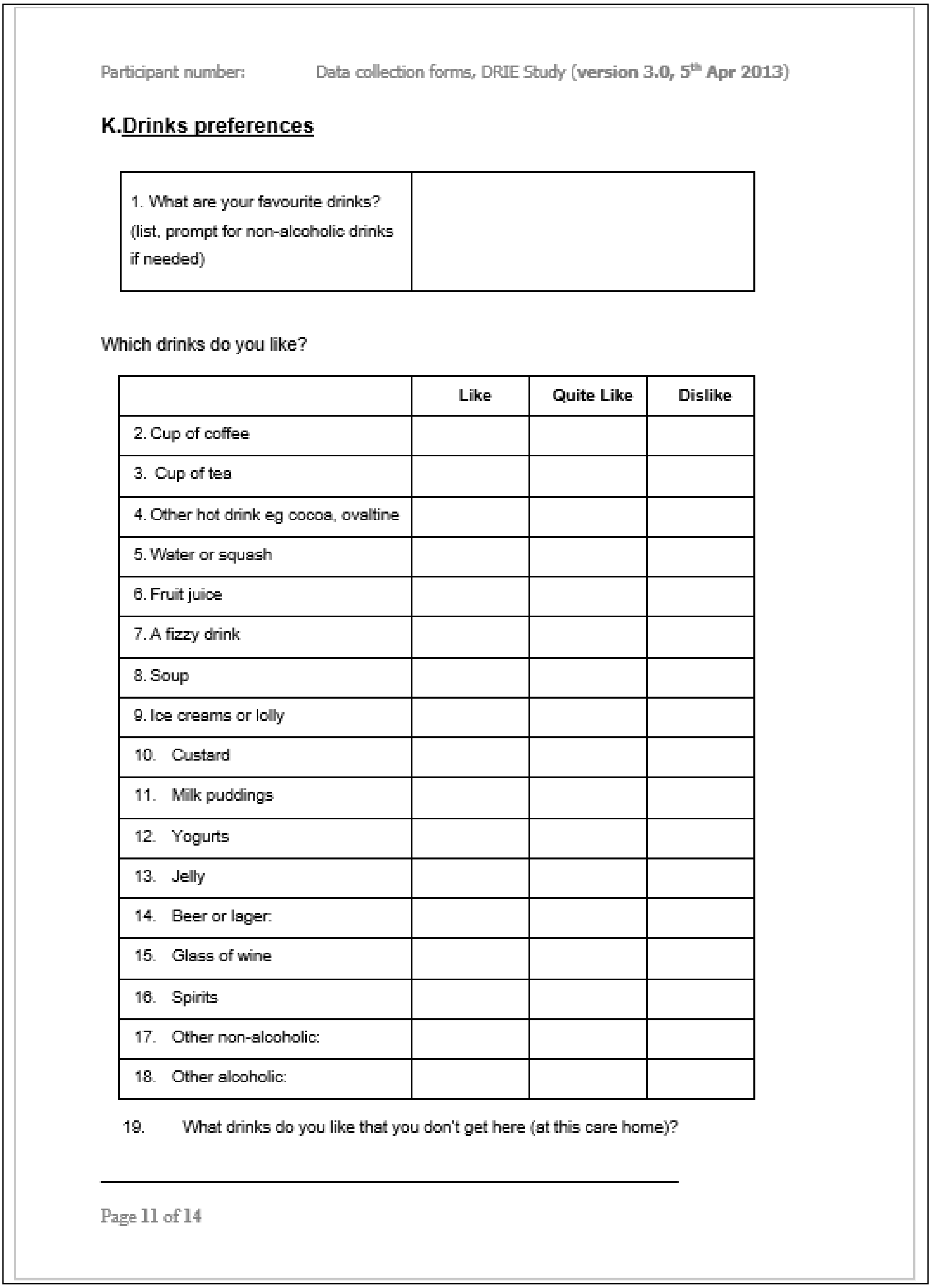

Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

K. Drinks preferences

1. What are your favourite drinks? (list, prompt for non-alcoholic drinks if needed)	

Which drinks do you like?

	Like	**Quite Like**	**Dislike**
2. Cup of coffee			
3. Cup of tea			
4. Other hot drink eg cocoa, ovaltine			
5. Water or squash			
6. Fruit juice			
7. A fizzy drink			
8. Soup			
9. Ice creams or lolly			
10. Custard			
11. Milk puddings			
12. Yogurts			
13. Jelly			
14. Beer or lager:			
15. Glass of wine			
16. Spirits			
17. Other non-alcoholic:			
18. Other alcoholic:			

19. What drinks do you like that you don't get here (at this care home)?

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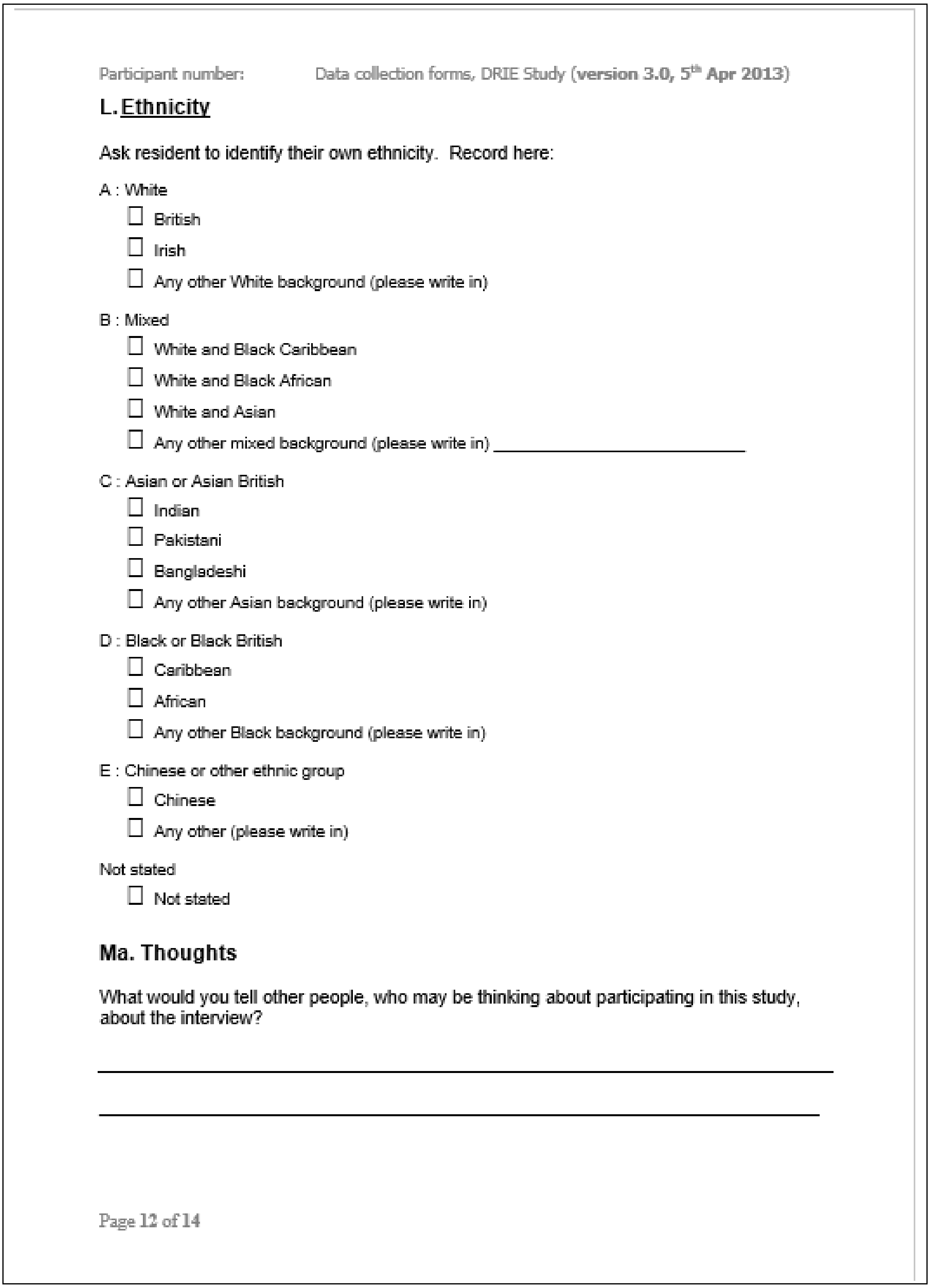


L. Ethnicity

Ask resident to identify their own ethnicity. Record here:

A : White
- ☐ British
- ☐ Irish
- ☐ Any other White background (please write in)

B : Mixed
- ☐ White and Black Caribbean
- ☐ White and Black African
- ☐ White and Asian
- ☐ Any other mixed background (please write in) ____________________________

C : Asian or Asian British
- ☐ Indian
- ☐ Pakistani
- ☐ Bangladeshi
- ☐ Any other Asian background (please write in)

D : Black or Black British
- ☐ Caribbean
- ☐ African
- ☐ Any other Black background (please write in)

E : Chinese or other ethnic group
- ☐ Chinese
- ☐ Any other (please write in)

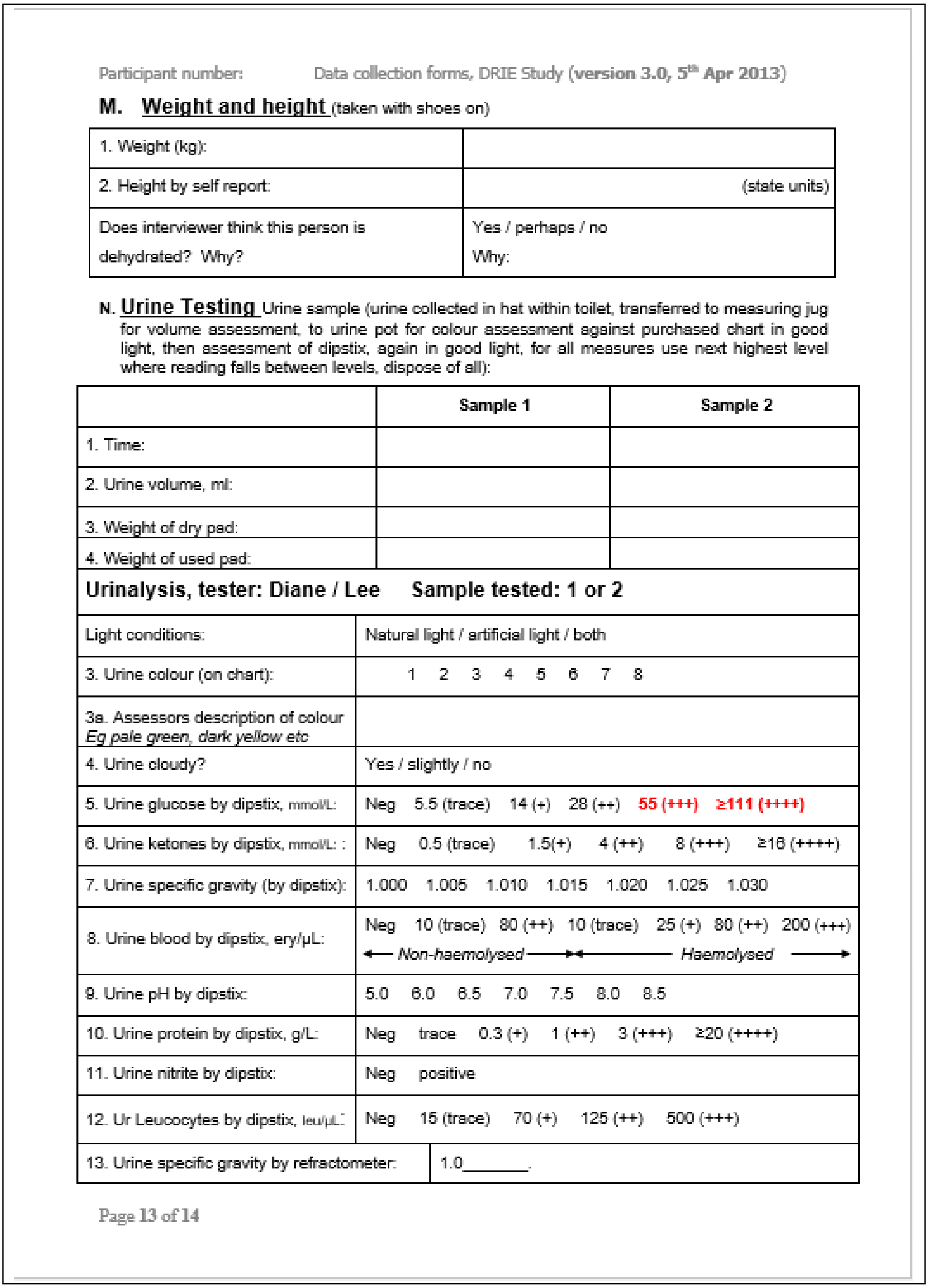
Not stated
- ☐ Not stated

Ma. Thoughts

What would you tell other people, who may be thinking about participating in this study, about the interview?

____

____



M. Weight and height (taken with shoes on)

1. Weight (kg):	
2. Height by self report:	(state units)
Does interviewer think this person is dehydrated? Why?	Yes / perhaps / no Why:

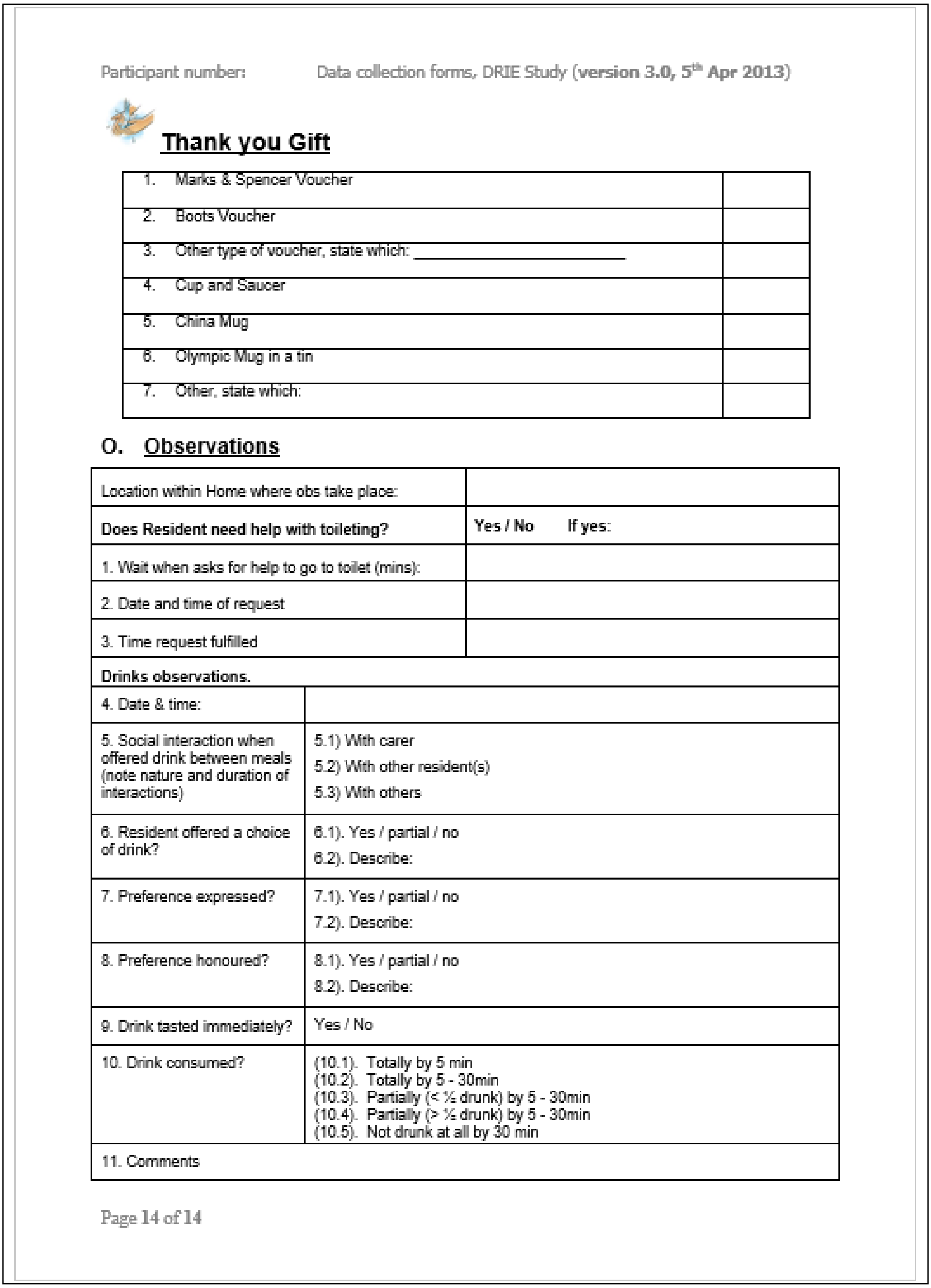
N. Urine Testing

Urine sample (urine collected in hat within toilet, transferred to measuring jug for volume assessment, to urine pot for colour assessment against purchased chart in good light, then assessment of dipstix, again in good light, for all measures use next highest level where reading falls between levels, dispose of all):

	Sample 1	Sample 2
1. Time:		
2. Urine volume, ml:		
3. Weight of dry pad:		
4. Weight of used pad:		

Urinalysis, tester: Diane / Lee Sample tested: 1 or 2

Light conditions:	Natural light / artificial light / both
3. Urine colour (on chart):	1 2 3 4 5 6 7 8
3a. Assessors description of colour *Eg pale green, dark yellow etc*	
4. Urine cloudy?	Yes / slightly / no
5. Urine glucose by dipstix, mmol/L:	Neg 5.5 (trace) 14 (+) 28 (++) 55 (+++) ≥111 (++++)
6. Urine ketones by dipstix, mmol/L: :	Neg 0.5 (trace) 1.5(+) 4 (++) 8 (+++) ≥16 (++++)
7. Urine specific gravity (by dipstix):	1.000 1.005 1.010 1.015 1.020 1.025 1.030
8. Urine blood by dipstix, ery/µL:	Neg 10 (trace) 80 (++) 10 (trace) 25 (+) 80 (++) 200 (+++) ← *Non-haemolysed* →← *Haemolysed* →
9. Urine pH by dipstix:	5.0 6.0 6.5 7.0 7.5 8.0 8.5
10. Urine protein by dipstix, g/L:	Neg trace 0.3 (+) 1 (++) 3 (+++) ≥20 (++++)
11. Urine nitrite by dipstix:	Neg positive
12. Ur Leucocytes by dipstix, leu/µL:	Neg 15 (trace) 70 (+) 125 (++) 500 (+++)
13. Urine specific gravity by refractometer:	1.0_______.



Participant number: Data collection forms, DRIE Study (**version 3.0, 5th Apr 2013**)

Thank you Gift

1. Marks & Spencer Voucher	
2. Boots Voucher	
3. Other type of voucher, state which: ______________________	
4. Cup and Saucer	
5. China Mug	
6. Olympic Mug in a tin	
7. Other, state which:	

O. Observations

Location within Home where obs take place:	
Does Resident need help with toileting?	**Yes / No** **If yes:**
1. Wait when asks for help to go to toilet (mins):	
2. Date and time of request	
3. Time request fulfilled	
Drinks observations.	
4. Date & time:	
5. Social interaction when offered drink between meals (note nature and duration of interactions)	5.1) With carer 5.2) With other resident(s) 5.3) With others
6. Resident offered a choice of drink?	6.1). Yes / partial / no 6.2). Describe:
7. Preference expressed?	7.1). Yes / partial / no 7.2). Describe:
8. Preference honoured?	8.1). Yes / partial / no 8.2). Describe:
9. Drink tasted immediately?	Yes / No
10. Drink consumed?	(10.1). Totally by 5 min (10.2). Totally by 5 - 30min (10.3). Partially (< ½ drunk) by 5 - 30min (10.4). Partially (> ½ drunk) by 5 - 30min (10.5). Not drunk at all by 30 min
11. Comments	

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Appendix 8: Additional Results Tables from Chapter 4

Positive and negative predictive values (PPV, NPV), positive and negative likelihood ratios (LR) (95%CI) for index tests assessed dichotomously

	Index Test	**PPV (95% CI)**	**NPV (95% CI)**	**Positive LR (95% CI)**	**Negative LR (95% CI)**
1.1	Tongue feeling dry (resident) (V. Dry/Sl. Dry vs Moist)	0.16 (0.05, 0.27)	0.79 (0.72, 0.86)	0.78 (0.38, 1.62)	1.07 (0.89, 1.28)
1.2	Tongue feeling dry (resident) (V. Dry vs Sl. Dry/Moist)	0.15 (-0.04, 0.35)	0.80 (0.74, 0.86)	0.73 (0.17, 3.16)	1.02 (0.93, 1.12)
2.1	Mouth, visual inspection (V. Dry/Sl. Dry vs Moist)	0.17 (0.07, 0.26)	0.80 (0.71, 0.89)	0.87 (0.51, 1.47)	1.10 (0.78, 1.56)
2.2	Mouth, visual inspection (V. Dry vs Sl. Dry/Moist)	0.17 (-0.04, 0.38)	0.81 (0.74, 0.88)	0.87 (0.20, 3.73)	1.01 (0.89, 1.15)
3.1	Mouth, tongue depressor (Strongly/Slightly vs Not Sticky)	0.15 (0.07, 0.24)	0.77 (0.67, 0.87)	0.78 (0.48, 1.26)	1.27 (0.86, 1.86)
3.2	Mouth, tongue depressor (Strongly vs Slightly/Not Sticky)	0.00 (0.00, 0.00)	0.81 (0.74, 0.87)	0.00 (N/C)	1.02 (0.99, 1.04)
4.1	Mouth, touch (V. Dry/Sl. Dry vs Moist)	0.21 (0.08, 0.33)	0.81 (0.74, 0.87)	1.05 (0.53, 2.09)	0.99 (0.81, 1.20)
4.2	Mouth, touch (V. Dry vs Sl. Dry/Moist)	0.00 (0.00, 0.00)	0.80 (0.74, 0.86)	0.00 (N/C)	1.03 (1.00, 1.06)
5.1	Mouth, tongue coated (V. Coated/Sl. Coated vs Not Coated)	0.18 (0.10, 0.26)	0.78 (0.69, 0.86)	0.87 (0.59, 1.27)	1.15 (0.82, 1.62)
5.2	Mouth, tongue coated (V. Coated vs Sl. Coated/Not Coated)	0.25 (0.08, 0.42)	0.81 (0.75, 0.87)	1.32 (0.57, 3.10)	0.95 (0.82, 1.11)
6.1	Mouth, tongue furrows (V. Furrowed/Sl. Furrowed vs Not Furrowed)	0.19 (0.10, 0.28)	0.79 (0.72, 0.87)	0.95 (0.61, 1.46)	1.04 (0.77, 1.41)
6.2	Mouth, tongue furrows (V. Furrowed vs Sl. Furrowed/Not Furrowed)	0.17 (-0.01, 0.34)	0.80 (0.73, 0.86)	0.79 (0.24, 2.60)	1.02 (0.92, 1.14)
7.1	Mouth, tongue scalloped (Yes/Slightly vs Not Scalloped)	0.22 (0.12, 0.31)	0.81 (0.74, 0.88)	1.10 (0.71, 1.71)	0.94 (0.69, 1.27)
7.2	Mouth, tongue scalloped (Yes vs Slightly/Not Scalloped)	0.18 (0.02, 0.34)	0.80 (0.73, 0.86)	0.88 (0.32, 2.45)	1.02 (0.89, 1.16)
8.1	Mouth, scalloped edge (Yes/Slightly vs Not Scalloped)	0.17 (-0.04, 0.38)	0.80 (0.71, 0.89)	0.82 (0.20, 3.44)	1.03 (0.86, 1.22)
8.2	Mouth, scalloped edge (Yes vs Slightly/Not Scalloped)	0.00 (0.00, 0.00)	0.80 (0.72, 0.88)	0.00 (N/C)	1.01 (0.99, 1.04)
9.1	Inside cheek, visual inspection (V. Dry/Sl. Dry vs Moist)	0.10 (-0.03, 0.23)	0.79 (0.73, 0.85)	0.45 (0.11, 1.85)	1.08 (0.97, 1.19)
9.2	Inside cheek, visual inspection (V. Dry vs Sl. Dry/Moist)	0.00 (0.00, 0.00)	0.80 (0.74, 0.86)	0.00 (N/C)	1.01 (0.99, 1.03)
10.1	Inside cheek, tongue depressor (Strongly/Slightly vs Not Sticky)	0.19 (0.10, 0.27)	0.80 (0.72, 0.87)	0.94 (0.60, 1.48)	1.04 (0.78, 1.39)
10.2	Inside cheek, tongue depressor (Strongly vs Slightly/Not Sticky)	0.20 (-0.15, 0.55)	0.80 (0.75, 0.86)	1.03 (0.12, 8.92)	1.00 (0.94, 1.06)
11.1	Inside cheek, touch (V. Dry/Sl. Dry vs Moist)	0.20 (0.09, 0.31)	0.80 (0.74, 0.87)	1.00 (0.55, 1.79)	1.00 (0.80, 1.26)
11.2	Inside cheek, touch (V. Dry vs Sl. Dry/Moist)	0.50 (-0.19, 1.19)	0.81 (0.75, 0.86)	4.08 (0.26, 63.73)	0.98 (0.92, 1.04)
12.1	Mouth, saliva under tongue (None vs Some/Plenty)	0.15 (-0.01, 0.31)	0.80 (0.73, 0.86)	0.71 (0.22, 2.29)	1.04 (0.93, 1.16)

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	Index Test	PPV (95% CI)	NPV (95% CI)	Positive LR (95% CI)	Negative LR (95% CI)
12.2	Mouth, saliva under tongue (None/Some vs Plenty)	0.18 (0.12, 0.25)	0.74 (0.60, 0.89)	0.91 (0.75, 1.12)	1.39 (0.72, 2.71)
13.1	Mouth, saliva consistency (Absent/Thick or Ropey vs Watery)	0.00 (0.00, 0.00)	0.81 (0.73, 0.90)	0.00 (N/C)	1.08 (1.01, 1.16)
13.2	Mouth, saliva consistency (Absent vs Thick or Ropey/Watery)	0.00 (0.00, 0.00)	0.82 (0.74, 0.91)	0.00 (N/C)	1.03 (0.99, 1.08)
14.1	Dentures (resident) (Full/Partial vs None)	0.21 (0.12, 0.30)	0.87 (0.78, 0.96)	1.21 (0.91, 1.62)	0.69 (0.35, 1.34)
14.2	Dentures (resident) (Full vs Partial/None)	0.19 (0.07, 0.30)	0.82 (0.74, 0.90)	1.03 (0.55, 1.95)	0.99 (0.73, 1.32)
15.1	Lips, inside lip dry, 0 secs (V. Dry/Sl. Dry vs Moist)	0.15 (0.07, 0.22)	0.75 (0.67, 0.84)	0.69 (0.44, 1.10)	1.32 (0.99, 1.75)
15.2	Lips, inside lip dry, 0 secs (V. Dry vs Sl. Dry/Moist)	0.33 (0.07, 0.60)	0.81 (0.75, 0.87)	2.00 (0.64, 6.28)	0.94 (0.84, 1.06)
16.1	Lips, inside lip dry, 30 secs (V. Dry/Sl. Dry vs Moist)	0.17 (0.10, 0.24)	0.76 (0.66, 0.85)	0.81 (0.57, 1.16)	1.28 (0.88, 1.85)
16.2	Lips, inside lip dry, 30 secs (V. Dry vs Sl. Dry/Moist)	0.20 (0.04, 0.36)	0.80 (0.74, 0.86)	0.99 (0.40, 2.47)	1.00 (0.87, 1.15)
17.1	Blue lips (V.Blue/Sl. Blue vs Not Blue)	0.16 (0.04, 0.28)	0.79 (0.72, 0.85)	0.76 (0.34, 1.69)	1.06 (0.91, 1.25)
17.2	Blue lips (V.Blue vs Sl. Blue/Not Blue)	(N/C)	0.80 (0.74, 0.85)	(N/C)	1.00 (1.00, 1.00)
18.1	Lips dry (V. Dry/Sl. Dry vs Normal/Moist)	0.27 (0.11, 0.42)	0.81 (0.75, 0.87)	1.44 (0.69, 2.97)	0.93 (0.78, 1.10)
18.2	Lips dry (V. Dry/Sl. Dry/Normal vs Moist)	0.21 (0.15, 0.27)	0.84 (0.68, 1.01)	1.03 (0.93, 1.15)	0.74 (0.23, 2.41)
18.3	Lips dry (V. Dry vs Sl. Dry/Normal/Moist)	(N/C)	0.80 (0.74, 0.86)	(N/C)	1.00 (1.00, 1.00)
19.1	Lips cracked (V. Chapped/Sl. Chapped vs Not Chapped)	0.20 (0.00, 0.40)	0.80 (0.74, 0.86)	0.99 (0.29, 3.32)	1.00 (0.90, 1.11)
19.2	Lips cracked (V. Chapped vs Sl. Chapped/Not Chapped)	(N/C)	0.80 (0.74, 0.86)	(N/C)	1.00 (1.00, 1.00)
20.1	Tears in eyes (Dry vs Normal/Teary)	0.00 (0.00, 0.00)	0.80 (0.74, 0.85)	0.00 (N/C)	1.01 (0.99, 1.02)
20.2	Tears in eyes (Dry/Normal vs Teary)	0.20 (0.14, 0.26)	0.74 (0.54, 0.93)	0.96 (0.84, 1.10)	1.40 (0.54, 3.65)
21	Sunken eyes	0.17 (0.05, 0.28)	0.79 (0.72, 0.85)	0.79 (0.38, 1.64)	1.06 (0.89, 1.27)
22	Ask resident, do eyes feel gritty	0.12 (-0.01, 0.24)	0.79 (0.72, 0.85)	0.52 (0.17, 1.64)	1.09 (0.97, 1.22)
23	Dry skin on cheek	0.20 (-0.15, 0.55)	0.80 (0.74, 0.86)	0.99 (0.11, 8.58)	1.00 (0.94, 1.06)
24.1	Palm 3v1 (Wet/Q. Damp/Sl. Dry vs Dry)	0.21 (0.14, 0.27)	0.81 (0.68, 0.94)	1.02 (0.86, 1.22)	0.91 (0.44, 1.92)
24.2	Palm 2v2 (Wet/Q. Damp vs Sl. Dry/Dry)	0.20 (0.15, 0.26)	1.00 (1.00, 1.00)	1.01 (0.99, 1.02)	0.00 (N/C)
24.3	Palm 1v3 (Wet vs Q. Damp/Sl. Dry/Dry)	(N/C)	0.80 (0.74, 0.86)	(N/C)	1.00 (1.00, 1.00)
25	Dry skin, upper arm	0.12 (-0.01, 0.25)	0.79 (0.73, 0.85)	0.55 (0.17, 1.74)	1.08 (0.96, 1.21)
26.1	Axilla, 2v2 categories (Dry/Sl. Dry vs Q. Damp/Wet)	0.18 (0.12, 0.25)	0.75 (0.63, 0.87)	0.89 (0.70, 1.14)	1.32 (0.77, 2.28)
26.2	Axilla, 1v3 categories (Dry vs Sl. Damp/Q. Damp/Wet)	0.24 (0.12, 0.35)	0.81 (0.75, 0.88)	1.22 (0.71, 2.09)	0.92 (0.72, 1.17)

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	Index Test	PPV (95% CI)	NPV (95% CI)	Positive LR (95% CI)	Negative LR (95% CI)
26.3	Axilla, 3v1 categories (Dry/Sl. Dry/Q. Damp vs Wet)	0.20 (0.14, 0.26)	0.80 (0.55, 1.05)	1.00 (0.92, 1.09)	0.99 (0.22, 4.48)
27.1	Forearm, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	0.18 (0.09, 0.28)	0.82 (0.73, 0.91)	1.01 (0.62, 1.64)	0.99 (0.66, 1.49)
27.2	Forearm, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0.25 (-0.05, 0.55)	0.82 (0.76, 0.89)	1.50 (0.32, 6.98)	0.97 (0.85, 1.10)
27.3	Forearm, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	0.15 (0.08, 0.22)	0.63 (0.43, 0.82)	0.75 (0.55, 1.01)	2.54 (1.26, 5.13)
27.4	Forearm, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	0.12 (0.02, 0.21)	0.77 (0.69, 0.86)	0.56 (0.24, 1.27)	1.25 (0.98, 1.59)
28.1	Upper arm, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	0.17 (0.06, 0.29)	0.80 (0.71, 0.89)	0.87 (0.44, 1.70)	1.07 (0.79, 1.46)
28.2	Upper arm, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0.17 (-0.13, 0.46)	0.81 (0.73, 0.88)	0.84 (0.10, 6.88)	1.01 (0.91, 1.11)
28.3	Upper arm, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	0.12 (0.05, 0.19)	0.70 (0.57, 0.83)	0.58 (0.34, 0.98)	1.86 (1.21, 2.87)
28.4	Upper arm, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	0.09 (-0.03, 0.21)	0.79 (0.72, 0.87)	0.44 (0.11, 1.75)	1.14 (0.97, 1.33)
29.1	Neck, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	0.14 (-0.01, 0.29)	0.82 (0.75, 0.89)	0.80 (0.26, 2.47)	1.04 (0.86, 1.26)
29.2	Neck, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0.00 (0.00, 0.00)	0.83 (0.76, 0.89)	0.00 (N/C)	1.01 (0.99, 1.03)
29.3	Neck, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	0.15 (0.05, 0.25)	0.80 (0.71, 0.89)	0.82 (0.45, 1.48)	1.15 (0.80, 1.65)
29.4	Neck, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	0.13 (-0.10, 0.35)	0.82 (0.75, 0.89)	0.66 (0.08, 5.06)	1.03 (0.92, 1.14)
30	Dry Skin, calf	0.15 (0.06, 0.23)	0.78 (0.70, 0.86)	0.71 (0.39, 1.29)	1.18 (0.92, 1.51)
34.1	Foot skin turgor, able to do test in either plane vs not able	0.32 (0.19, 0.45)	0.84 (0.78, 0.90)	1.85 (1.12, 3.05)	0.77 (0.59, 1.01)
37.1	Foot vein filling, able to do test vs not able to	0.29 (0.17, 0.42)	0.83 (0.77, 0.89)	1.64 (1.01, 2.67)	0.80 (0.61, 1.05)
41.1	Urinalysis, sample provided vs no sample	0.26 (0.10, 0.41)	0.81 (0.75, 0.87)	1.37 (0.67, 2.82)	0.93 (0.78, 1.11)
43.1	Urine, cloudy (Not Cloudy vs Partial Cloudy/Totally Cloudy)	0.17 (0.07, 0.28)	0.80 (0.72, 0.88)	0.89 (0.49, 1.61)	1.06 (0.81, 1.38)
43.2	Urine, cloudy (Not Cloudy/Partial Cloudy vs Totally Cloudy)	0.12 (-0.04, 0.27)	0.80 (0.73, 0.87)	0.56 (0.14, 2.34)	1.06 (0.94, 1.19)
43.3	Urinary nitrites	0.13 (-0.01, 0.26)	0.80 (0.73, 0.87)	0.60 (0.19, 1.90)	1.08 (0.94, 1.24)
53	Feeling thirsty currently	0.14 (0.04, 0.24)	0.77 (0.70, 0.84)	0.63 (0.31, 1.29)	1.15 (0.96, 1.39)
54	Feeling headachy currently	0.19 (0.00, 0.38)	0.79 (0.73, 0.85)	0.89 (0.27, 2.95)	1.01 (0.91, 1.12)
55	Feeling ‘out of sorts’ currently	0.05 (-0.02, 0.11)	0.75 (0.68, 0.82)	0.19 (0.05, 0.75)	1.32 (1.17, 1.51)
56	Feeling tired currently	0.17 (0.09, 0.26)	0.78 (0.70, 0.85)	0.82 (0.51, 1.33)	1.13 (0.86, 1.47)

Pre- and post-test probability and diagnostic odds ratios (95%CI) for index tests assessed dichotomously

	Index Test	Pre-test probability (95% CI)	Post-test probability, given T+ (95% CI)	Post-test probability, given T- (95% CI)	Diagnostic Odds Ratio (95% CI)
1.1	Tongue feeling dry (resident) (V. Dry/Sl. Dry vs Moist)	0.20 (0.14, 0.26)	0.16 (0.05, 0.27)	0.21 (0.14, 0.28)	0.73 (0.30, 1.81)
1.2	Tongue feeling dry (resident) (V. Dry vs Sl. Dry/Moist)	0.20 (0.14, 0.26)	0.15 (-0.04, 0.35)	0.20 (0.14, 0.26)	0.72 (0.15, 3.38)
2.1	Mouth, visual inspection (V. Dry/Sl. Dry vs Moist)	0.19 (0.12, 0.25)	0.17 (0.07, 0.26)	0.20 (0.11, 0.29)	0.79 (0.33, 1.89)
2.2	Mouth, visual inspection (V. Dry vs Sl. Dry/Moist)	0.19 (0.12, 0.25)	0.17 (-0.04, 0.38)	0.19 (0.12, 0.26)	0.86 (0.18, 4.17)
3.1	Mouth, tongue depressor (Strongly/Slightly vs Not Sticky)	0.19 (0.12, 0.25)	0.15 (0.07, 0.24)	0.23 (0.13, 0.33)	0.61 (0.26, 1.45)
3.2	Mouth, tongue depressor (Strongly vs Slightly/Not Sticky)	0.19 (0.12, 0.25)	0.00 (0.00, 0.00)	0.19 (0.13, 0.26)	0.00 (N/C)
4.1	Mouth, touch (V. Dry/Sl. Dry vs Moist)	0.20 (0.14, 0.25)	0.21 (0.08, 0.33)	0.19 (0.13, 0.26)	1.07 (0.44, 2.58)
4.2	Mouth, touch (V. Dry vs Sl. Dry/Moist)	0.20 (0.14, 0.25)	0.00 (0.00, 0.00)	0.20 (0.14, 0.26)	0.00 (N/C)
5.1	Mouth, tongue coated (V. Coated/Sl. Coated vs Not Coated)	0.20 (0.14, 0.26)	0.18 (0.10, 0.26)	0.22 (0.14, 0.31)	0.75 (0.36, 1.55)
5.2	Mouth, tongue coated (V. Coated vs Sl. Coated/Not Coated)	0.20 (0.14, 0.26)	0.25 (0.08, 0.42)	0.19 (0.13, 0.25)	1.39 (0.51, 3.78)
6.1	Mouth, tongue furrows (V. Furrowed/Sl. Furrowed vs Not Furrowed)	0.20 (0.14, 0.26)	0.19 (0.10, 0.28)	0.21 (0.13, 0.28)	0.91 (0.44, 1.89)
6.2	Mouth, tongue furrows (V. Furrowed vs Sl. Furrowed/Not Furrowed)	0.20 (0.14, 0.26)	0.17 (-0.01, 0.34)	0.20 (0.14, 0.27)	0.78 (0.21, 2.84)
7.1	Mouth, tongue scalloped (Yes/Slightly vs Not Scalloped)	0.20 (0.14, 0.26)	0.22 (0.12, 0.31)	0.19 (0.12, 0.26)	1.18 (0.56, 2.48)
7.2	Mouth, tongue scalloped (Yes vs Slightly/Not Scalloped)	0.20 (0.14, 0.26)	0.18 (0.02, 0.34)	0.20 (0.14, 0.27)	0.87 (0.27, 2.74)
8.1	Mouth, scalloped edge (Yes/Slightly vs Not Scalloped)	0.20 (0.12, 0.27)	0.17 (-0.04, 0.38)	0.20 (0.11, 0.29)	0.80 (0.16, 4.00)
8.2	Mouth, scalloped edge (Yes vs Slightly/Not Scalloped)	0.20 (0.12, 0.27)	0.00 (0.00, 0.00)	0.20 (0.12, 0.28)	0.00 (N/C)
9.1	Inside cheek, visual inspection (V. Dry/Sl. Dry vs Moist)	0.20 (0.14, 0.26)	0.10 (-0.03, 0.23)	0.21 (0.15, 0.27)	0.42 (0.09, 1.89)
9.2	Inside cheek, visual inspection (V. Dry vs Sl. Dry/Moist)	0.20 (0.14, 0.26)	0.00 (0.00, 0.00)	0.20 (0.14, 0.26)	0.00 (N/C)
10.1	Inside cheek, tongue depressor (Strongly/Slightly vs Not Sticky)	0.20 (0.14, 0.25)	0.19 (0.10, 0.27)	0.20 (0.13, 0.28)	0.91 (0.43, 1.91)
10.2	Inside cheek, tongue depressor (Strongly vs Slightly/Not Sticky)	0.20 (0.14, 0.25)	0.20 (-0.15, 0.55)	0.20 (0.14, 0.25)	1.03 (0.11, 9.49)
11.1	Inside cheek, touch (V. Dry/Sl. Dry vs Moist)	0.20 (0.14, 0.25)	0.20 (0.09, 0.31)	0.20 (0.13, 0.26)	0.99 (0.44, 2.24)
11.2	Inside cheek, touch (V. Dry vs Sl. Dry/Moist)	0.20 (0.14, 0.25)	0.50 (-0.19, 1.19)	0.19 (0.14, 0.25)	4.17 (0.25, 68.34)
12.1	Mouth, saliva under tongue (None vs Some/Plenty)	0.20 (0.14, 0.26)	0.15 (-0.01, 0.31)	0.20 (0.14, 0.27)	0.68 (0.19, 2.48)

(continued on next page)

	Index Test	Pre-test probability (95% CI)	Post-test probability, given T+ (95% CI)	Post-test probability, given T- (95% CI)	Diagnostic Odds Ratio (95% CI)
12.2	Mouth, saliva under tongue (None/Some vs Plenty)	0.20 (0.14, 0.26)	0.18 (0.12, 0.25)	0.26 (0.11, 0.40)	0.66 (0.28, 1.56)
13.1	Mouth, saliva consistency (Absent/Thick or Ropey vs Watery)	0.18 (0.09, 0.26)	0.00 (0.00, 0.00)	0.19 (0.10, 0.27)	0.00 (N/C)
13.2	Mouth, saliva consistency (Absent vs Thick or Ropey/Watery)	0.18 (0.09, 0.26)	0.00 (0.00, 0.00)	0.18 (0.09, 0.26)	0.00 (N/C)
14.1	Dentures (resident) (Full/Partial vs None)	0.18 (0.12, 0.25)	0.21 (0.12, 0.30)	0.13 (0.04, 0.22)	1.77 (0.68, 4.57)
14.2	Dentures (resident) (Full vs Partial/None)	0.18 (0.12, 0.25)	0.19 (0.07, 0.30)	0.18 (0.10, 0.26)	1.05 (0.41, 2.66)
15.1	Lips, inside lip dry, 0 secs (V. Dry/Sl. Dry vs Moist)	0.20 (0.14, 0.26)	0.15 (0.07, 0.22)	0.25 (0.16, 0.33)	0.53 (0.25, 1.11)
15.2	Lips, inside lip dry, 0 secs (V. Dry vs Sl. Dry/Moist)	0.20 (0.14, 0.26)	0.33 (0.07, 0.60)	0.19 (0.13, 0.25)	2.12 (0.60, 7.47)
16.1	Lips, inside lip dry, 30 secs (V. Dry/Sl. Dry vs Moist)	0.20 (0.14, 0.26)	0.17 (0.10, 0.24)	0.24 (0.15, 0.34)	0.64 (0.31, 1.31)
16.2	Lips, inside lip dry, 30 secs (V. Dry vs Sl. Dry/Moist)	0.20 (0.14, 0.26)	0.20 (0.04, 0.36)	0.20 (0.14, 0.26)	0.99 (0.35, 2.85)
17.1	Blue lips (V.Blue/Sl. Blue vs Not Blue)	0.20 (0.15, 0.26)	0.16 (0.04, 0.28)	0.21 (0.15, 0.28)	0.71 (0.27, 1.86)
17.2	Blue lips (V.Blue vs Sl. Blue/Not Blue)	0.20 (0.15, 0.26)	(N/C)	0.20 (0.15, 0.26)	(N/C)
18.1	Lips dry (V. Dry/Sl. Dry vs Normal/Moist)	0.20 (0.14, 0.26)	0.27 (0.11, 0.42)	0.19 (0.13, 0.25)	1.55 (0.63, 3.82)
18.2	Lips dry (V. Dry/Sl. Dry/Normal vs Moist)	0.20 (0.14, 0.26)	0.21 (0.15, 0.27)	0.16 (-0.01, 0.32)	1.39 (0.38, 5.05)
18.3	Lips dry (V. Dry vs Sl. Dry/Normal/Moist)	0.20 (0.14, 0.26)	(N/C)	0.20 (0.14, 0.26)	(N/C)
19.1	Lips cracked (V. Chapped/Sl. Chapped vs Not Chapped)	0.20 (0.14, 0.26)	0.20 (0.00, 0.40)	0.20 (0.14, 0.26)	0.99 (0.26, 3.68)
19.2	Lips cracked (V. Chapped vs Sl. Chapped/Not Chapped)	0.20 (0.14, 0.26)	(N/C)	0.20 (0.14, 0.26)	(N/C)
20.1	Tears in eyes (Dry vs Normal/Teary)	0.20 (0.15, 0.26)	0.00 (0.00, 0.00)	0.20 (0.15, 0.26)	0.00 (N/C)
20.2	Tears in eyes (Dry/Normal vs Teary)	0.20 (0.15, 0.26)	0.20 (0.14, 0.26)	0.26 (0.07, 0.46)	0.68 (0.23, 2.04)
21	Sunken eyes	0.20 (0.14, 0.26)	0.17 (0.05, 0.28)	0.21 (0.15, 0.28)	0.74 (0.30, 1.83)
22	Ask resident, do eyes feel gritty	0.20 (0.14, 0.26)	0.12 (-0.01, 0.24)	0.21 (0.15, 0.28)	0.48 (0.14, 1.69)
23	Dry skin on cheek	0.20 (0.14, 0.26)	0.20 (-0.15, 0.55)	0.20 (0.14, 0.26)	0.99 (0.11, 9.09)
24.1	Palm 3v1 (Wet/Q. Damp/Sl. Dry vs Dry)	0.20 (0.14, 0.26)	0.21 (0.14, 0.27)	0.19 (0.06, 0.32)	1.12 (0.45, 2.79)
24.2	Palm 2v2 (Wet/Q. Damp vs Sl. Dry/Dry)	0.20 (0.14, 0.26)	0.20 (0.15, 0.26)	0.00 (0.00, 0.00)	(N/C)
24.3	Palm 1v3 (Wet vs Q. Damp/Sl. Dry/Dry)	0.20 (0.14, 0.26)	(N/C)	0.20 (0.14, 0.26)	(N/C)
25	Dry skin, upper arm	0.20 (0.14, 0.26)	0.12 (-0.01, 0.25)	0.21 (0.15, 0.27)	0.51 (0.14, 1.80)
26.1	Axilla, 2v2 categories (Dry/Sl. Dry vs Q. Damp/Wet)	0.20 (0.14, 0.26)	0.18 (0.12, 0.25)	0.25 (0.13, 0.37)	0.68 (0.31, 1.48)
26.2	Axilla, 1v3 categories (Dry vs Sl. Damp/Q. Damp/Wet)	0.20 (0.14, 0.26)	0.24 (0.12, 0.35)	0.19 (0.12, 0.25)	1.33 (0.61, 2.90)

(continued on next page)

	Index Test	Pre-test probability (95% CI)	Post-test probability, given T+ (95% CI)	Post-test probability, given T- (95% CI)	Diagnostic Odds Ratio (95% CI)
26.3	Axilla, 3v1 categories (Dry/Sl. Dry/Q. Damp vs Wet)	0.20 (0.14, 0.26)	0.20 (0.14, 0.26)	0.20 (-0.05, 0.45)	1.01 (0.20, 4.96)
27.1	Forearm, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	0.18 (0.12, 0.25)	0.18 (0.09, 0.28)	0.18 (0.09, 0.27)	1.02 (0.42, 2.48)
27.2	Forearm, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0.18 (0.12, 0.25)	0.25 (-0.05, 0.55)	0.18 (0.11, 0.24)	1.55 (0.29, 8.17)
27.3	Forearm, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	0.19 (0.12, 0.26)	0.15 (0.08, 0.22)	0.38 (0.18, 0.57)	0.29 (0.11, 0.78)
27.4	Forearm, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	0.19 (0.12, 0.26)	0.12 (0.02, 0.21)	0.23 (0.14, 0.31)	0.45 (0.16, 1.29)
28.1	Upper arm, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	0.19 (0.12, 0.26)	0.17 (0.06, 0.29)	0.20 (0.11, 0.29)	0.81 (0.30, 2.16)
28.2	Upper arm, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0.19 (0.12, 0.26)	0.17 (-0.13, 0.46)	0.19 (0.12, 0.27)	0.84 (0.09, 7.52)
28.3	Upper arm, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	0.19 (0.12, 0.25)	0.12 (0.05, 0.19)	0.30 (0.17, 0.43)	0.31 (0.12, 0.79)
28.4	Upper arm, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	0.19 (0.12, 0.25)	0.09 (-0.03, 0.21)	0.21 (0.13, 0.28)	0.39 (0.08, 1.78)
29.1	Neck, skin dimpling (V./Sl. Dimpled vs Not Dimpled)	0.17 (0.11, 0.24)	0.14 (-0.01, 0.29)	0.18 (0.11, 0.25)	0.76 (0.20, 2.85)
29.2	Neck, skin dimpling (V. Dimpled vs Sl./Not Dimpled)	0.17 (0.11, 0.24)	0.00 (0.00, 0.00)	0.17 (0.11, 0.24)	0.00 (N/C)
29.3	Neck, skin crimpling (V./Sl. Crimpled vs Not Crimpled)	0.18 (0.11, 0.25)	0.15 (0.05, 0.25)	0.20 (0.11, 0.29)	0.71 (0.27, 1.84)
29.4	Neck, skin crimpling (V. Crimpled vs Sl./Not Crimpled)	0.18 (0.11, 0.25)	0.13 (-0.10, 0.35)	0.18 (0.11, 0.25)	0.64 (0.07, 5.48)
30	Dry Skin, calf	0.19 (0.13, 0.25)	0.15 (0.06, 0.23)	0.22 (0.14, 0.30)	0.60 (0.26, 1.39)
34.1	Foot skin turgor, able to do test in either plane vs not able	0.20 (0.14, 0.26)	0.32 (0.19, 0.45)	0.16 (0.10, 0.22)	2.40 (1.13, 5.14)
37.1	Foot vein filling, able to do test vs not able to	0.20 (0.14, 0.26)	0.29 (0.17, 0.42)	0.17 (0.11, 0.23)	2.07 (0.97, 4.38)
41.1	Urinalysis, sample provided vs no sample	0.20 (0.14, 0.26)	0.26 (0.10, 0.41)	0.19 (0.13, 0.25)	1.47 (0.60, 3.61)
43.1	Urine, cloudy (Not Cloudy vs Partial Cloudy/Totally Cloudy)	0.19 (0.13, 0.25)	0.17 (0.07, 0.28)	0.20 (0.12, 0.28)	0.84 (0.35, 1.98)
43.2	Urine, cloudy (Not Cloudy/Partial Cloudy vs Totally Cloudy)	0.19 (0.13, 0.25)	0.12 (-0.04, 0.27)	0.20 (0.13, 0.27)	0.53 (0.12, 2.47)
43.3	Urinary nitrites	0.19 (0.13, 0.25)	0.13 (-0.01, 0.26)	0.20 (0.13, 0.27)	0.56 (0.16, 2.02)
53	Feeling thirsty currently	0.21 (0.15, 0.26)	0.14 (0.04, 0.24)	0.23 (0.16, 0.30)	0.55 (0.22, 1.34)
54	Feeling headachy currently	0.21 (0.15, 0.27)	0.19 (0.00, 0.38)	0.21 (0.15, 0.27)	0.88 (0.24, 3.25)
55	Feeling ‘out of sorts’ currently	0.20 (0.14, 0.26)	0.05 (-0.02, 0.11)	0.25 (0.18, 0.32)	0.14 (0.03, 0.62)
56	Feeling tired currently	0.20 (0.15, 0.26)	0.17 (0.09, 0.26)	0.22 (0.15, 0.30)	0.73 (0.35, 1.54)

Appendix 9: PRISMA Checklist

PRISMA 2009 Checklist

Systematic Review: reducing dehydration risk,

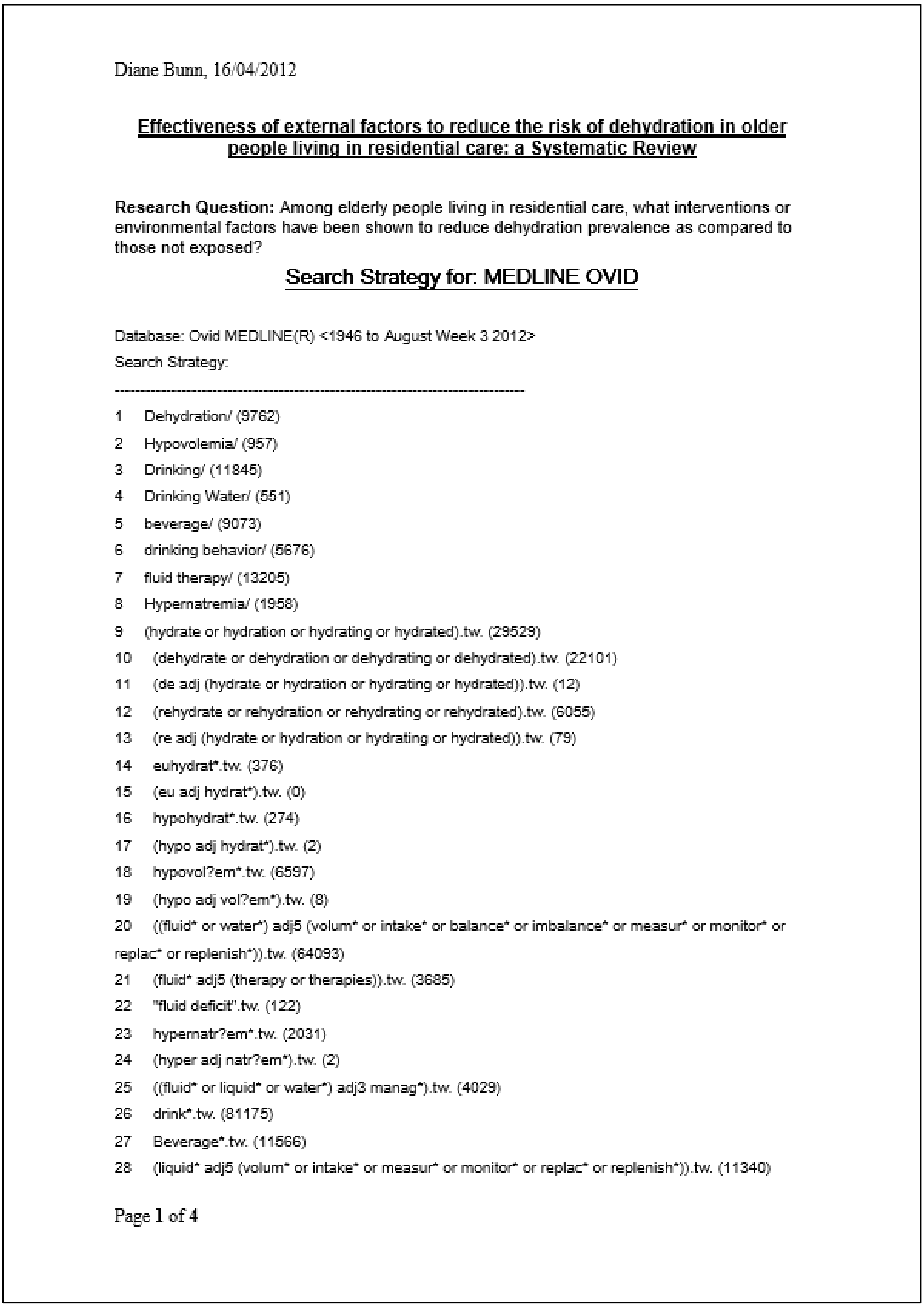
Section/topic	#	Checklist item	Reported on section
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Chapter 5
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Chapter 5
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	2.12
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	3.42; 5.2; 5.3
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	5.3.7
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5.3
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5.3.7; 5.3.8

Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix 10
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5.3.8
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5.3.9
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5.3.9
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5.3.10
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	5.3.9
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	5.3.11
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Figure 5-1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Tables 5-1, 5-2
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	5.5; Figure 5-2; Table 5-3

Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	5.5; Tables 5-4, 5-5, 5-6, 5-7
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	5.6
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	5.6
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	5.8
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Page 4

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi:10.1371/journal.pmed1000097 For more information, visit: **www.prisma-statement.org**.

Appendix 10: Systematic Review MEDLINE Search Strategy



Diane Bunn, 16/04/2012

Effectiveness of external factors to reduce the risk of dehydration in older people living in residential care: a Systematic Review

Research Question: Among elderly people living in residential care, what interventions or environmental factors have been shown to reduce dehydration prevalence as compared to those not exposed?

Search Strategy for: MEDLINE OVID

Database: Ovid MEDLINE(R) <1946 to August Week 3 2012>

Search Strategy:

----

1 Dehydration/ (9762)
2 Hypovolemia/ (957)
3 Drinking/ (11845)
4 Drinking Water/ (551)
5 beverage/ (9073)
6 drinking behavior/ (5676)
7 fluid therapy/ (13205)
8 Hypernatremia/ (1958)
9 (hydrate or hydration or hydrating or hydrated).tw. (29529)
10 (dehydrate or dehydration or dehydrating or dehydrated).tw. (22101)
11 (de adj (hydrate or hydration or hydrating or hydrated)).tw. (12)
12 (rehydrate or rehydration or rehydrating or rehydrated).tw. (6055)
13 (re adj (hydrate or hydration or hydrating or hydrated)).tw. (79)
14 euhydrat*.tw. (376)
15 (eu adj hydrat*).tw. (0)
16 hypohydrat*.tw. (274)
17 (hypo adj hydrat*).tw. (2)
18 hypovol?em*.tw. (6597)
19 (hypo adj vol?em*).tw. (8)
20 ((fluid* or water*) adj5 (volum* or intake* or balance* or imbalance* or measur* or monitor* or replac* or replenish*)).tw. (64093)
21 (fluid* adj5 (therapy or therapies)).tw. (3685)
22 "fluid deficit".tw. (122)
23 hypernatr?em*.tw. (2031)
24 (hyper adj natr?em*).tw. (2)
25 ((fluid* or liquid* or water*) adj3 manag*).tw. (4029)
26 drink*.tw. (81175)
27 Beverage*.tw. (11566)
28 (liquid* adj5 (volum* or intake* or measur* or monitor* or replac* or replenish*)).tw. (11340)

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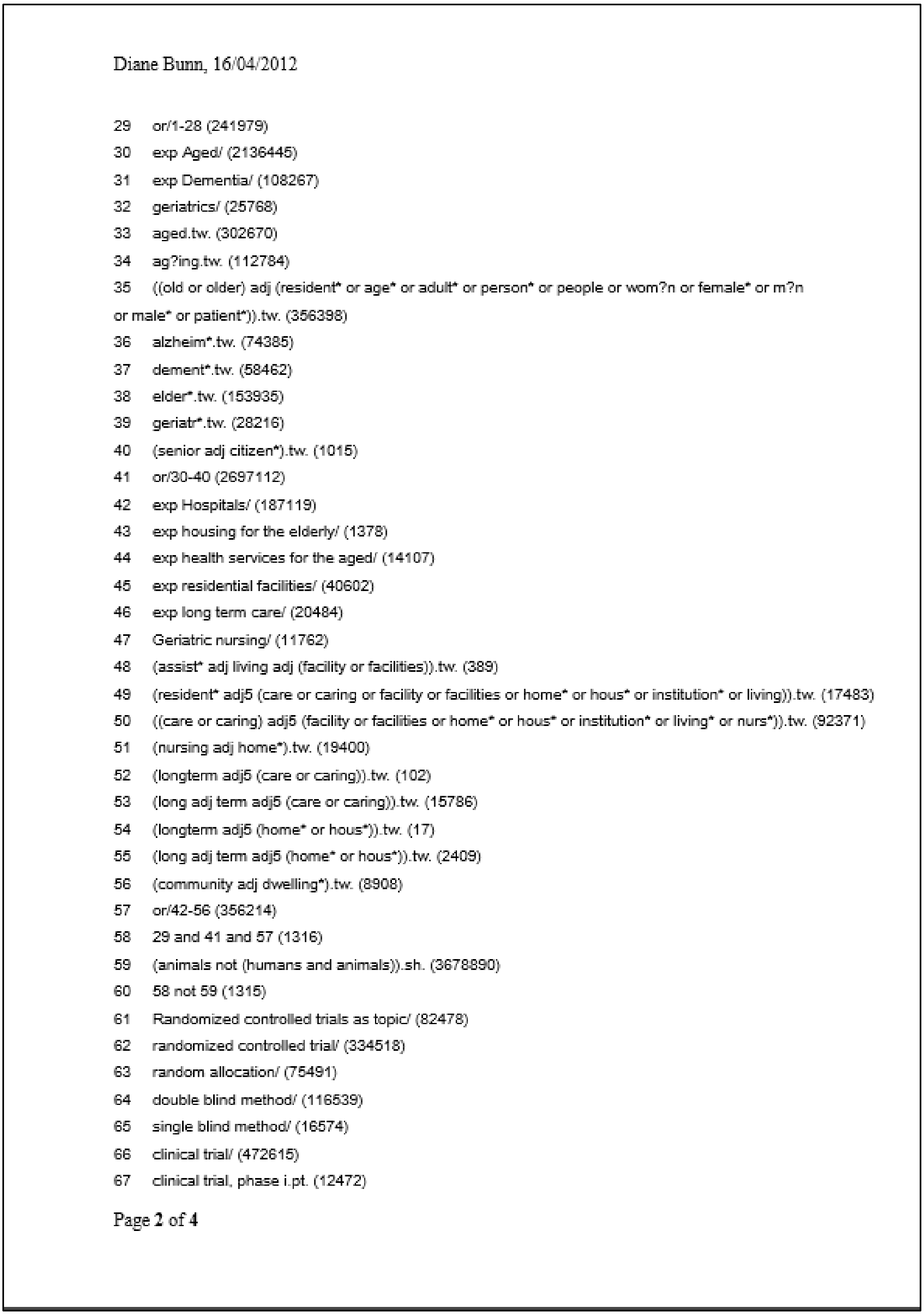
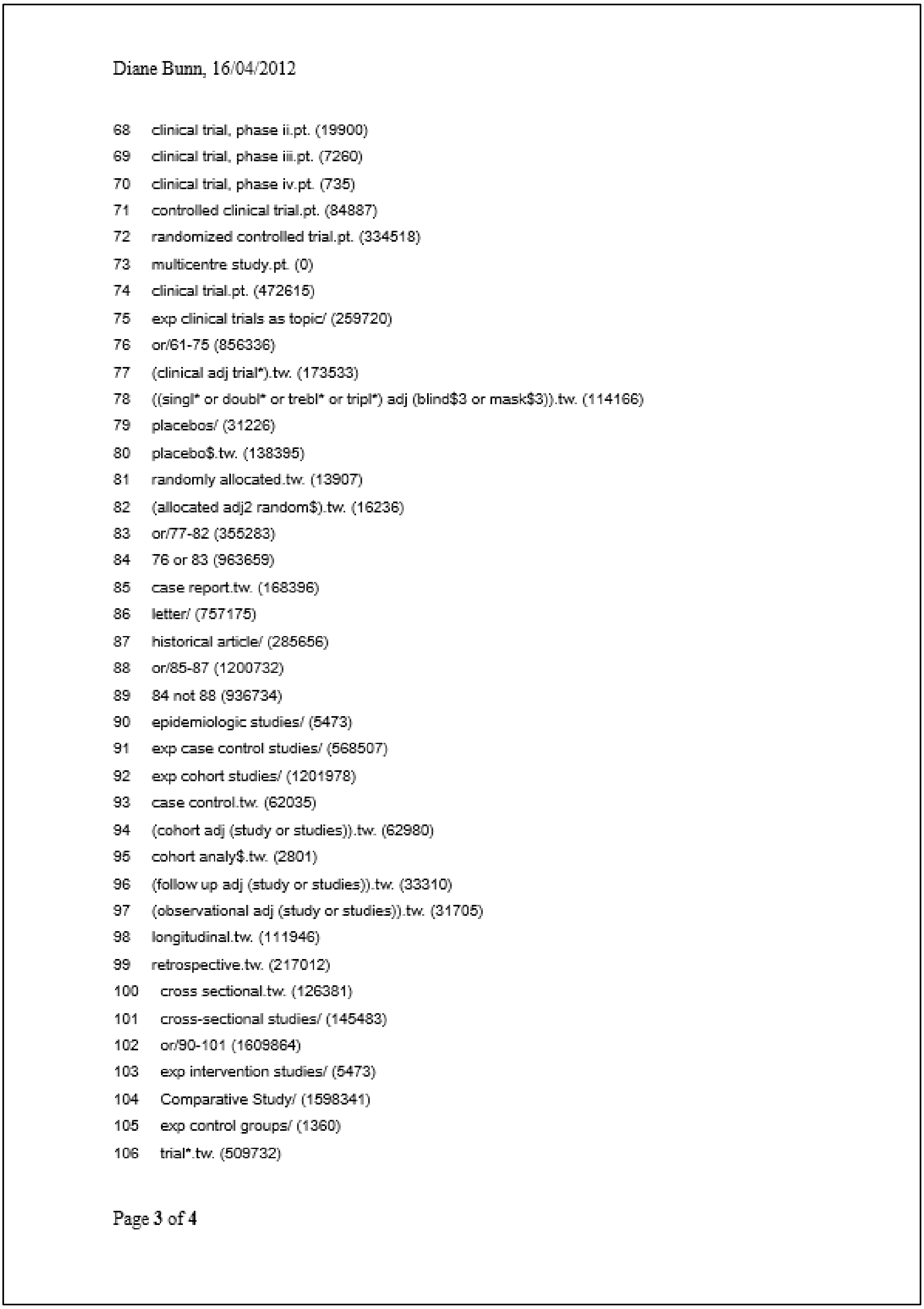


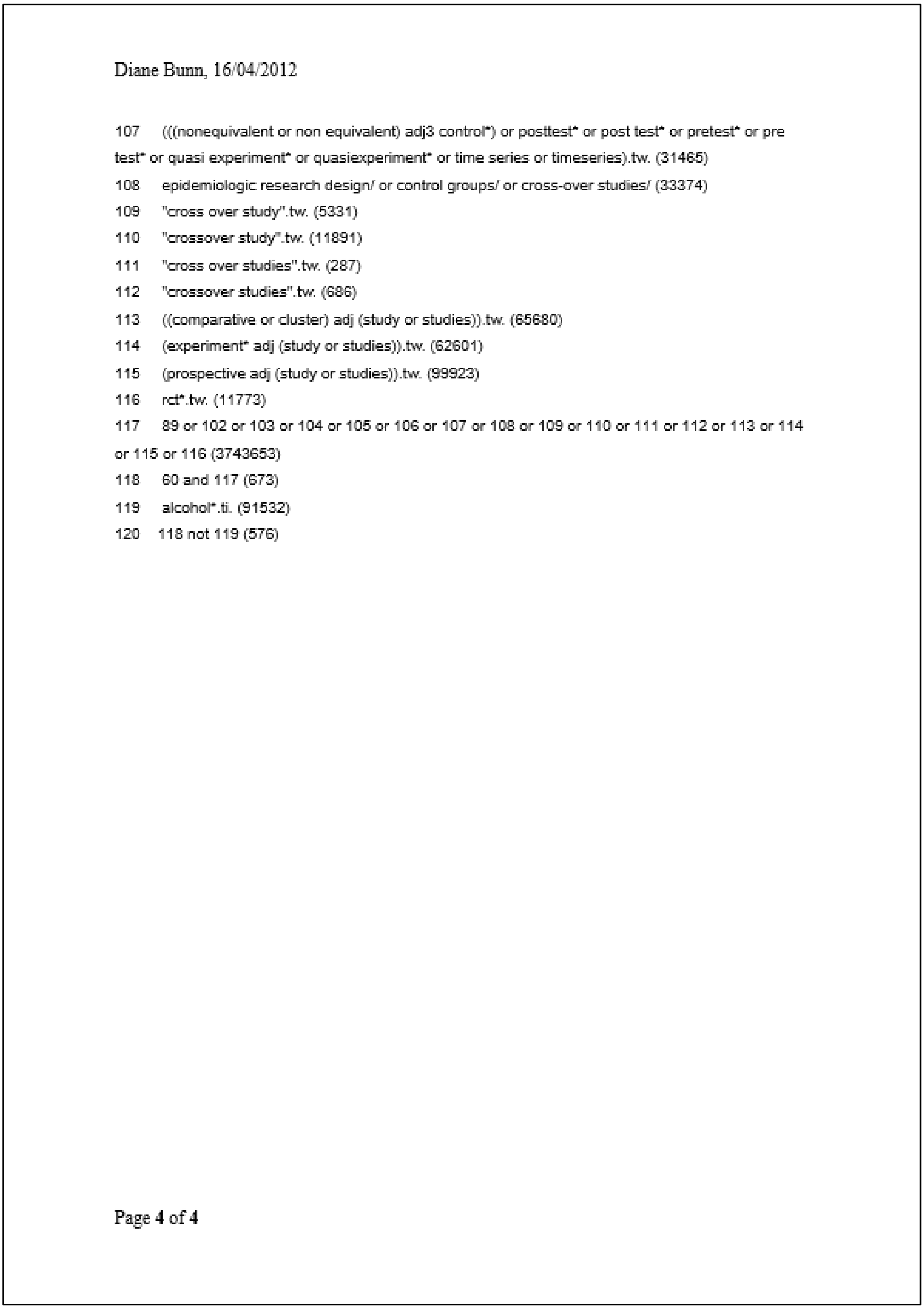
29 or/1-28 (241979)
30 exp Aged/ (2136445)
31 exp Dementia/ (108267)
32 geriatrics/ (25768)
33 aged.tw. (302670)
34 ag?ing.tw. (112784)
35 ((old or older) adj (resident* or age* or adult* or person* or people or wom?n or female* or m?n or male* or patient*)).tw. (356398)
36 alzheim*.tw. (74385)
37 dement*.tw. (58462)
38 elder*.tw. (153935)
39 geriatr*.tw. (28216)
40 (senior adj citizen*).tw. (1015)
41 or/30-40 (2697112)
42 exp Hospitals/ (187119)
43 exp housing for the elderly/ (1378)
44 exp health services for the aged/ (14107)
45 exp residential facilities/ (40602)
46 exp long term care/ (20484)
47 Geriatric nursing/ (11762)
48 (assist* adj living adj (facility or facilities)).tw. (389)
49 (resident* adj5 (care or caring or facility or facilities or home* or hous* or institution* or living)).tw. (17483)
50 ((care or caring) adj5 (facility or facilities or home* or hous* or institution* or living* or nurs*)).tw. (92371)
51 (nursing adj home*).tw. (19400)
52 (longterm adj5 (care or caring)).tw. (102)
53 (long adj term adj5 (care or caring)).tw. (15786)
54 (longterm adj5 (home* or hous*)).tw. (17)
55 (long adj term adj5 (home* or hous*)).tw. (2409)
56 (community adj dwelling*).tw. (8908)
57 or/42-56 (356214)
58 29 and 41 and 57 (1316)
59 (animals not (humans and animals)).sh. (3678890)
60 58 not 59 (1315)
61 Randomized controlled trials as topic/ (82478)
62 randomized controlled trial/ (334518)
63 random allocation/ (75491)
64 double blind method/ (116539)
65 single blind method/ (16574)
66 clinical trial/ (472615)
67 clinical trial, phase i.pt. (12472)



Diane Bunn, 16/04/2012

68 clinical trial, phase ii.pt. (19900)
69 clinical trial, phase iii.pt. (7260)
70 clinical trial, phase iv.pt. (735)
71 controlled clinical trial.pt. (84887)
72 randomized controlled trial.pt. (334518)
73 multicentre study.pt. (0)
74 clinical trial.pt. (472615)
75 exp clinical trials as topic/ (259720)
76 or/61-75 (856336)
77 (clinical adj trial*).tw. (173533)
78 ((singl* or doubl* or trebl* or tripl*) adj (blind$3 or mask$3)).tw. (114166)
79 placebos/ (31226)
80 placebo$.tw. (138395)
81 randomly allocated.tw. (13907)
82 (allocated adj2 random$).tw. (16236)
83 or/77-82 (355283)
84 76 or 83 (963659)
85 case report.tw. (168396)
86 letter/ (757175)
87 historical article/ (285656)
88 or/85-87 (1200732)
89 84 not 88 (936734)
90 epidemiologic studies/ (5473)
91 exp case control studies/ (568507)
92 exp cohort studies/ (1201978)
93 case control.tw. (62035)
94 (cohort adj (study or studies)).tw. (62980)
95 cohort analy$.tw. (2801)
96 (follow up adj (study or studies)).tw. (33310)
97 (observational adj (study or studies)).tw. (31705)
98 longitudinal.tw. (111946)
99 retrospective.tw. (217012)
100 cross sectional.tw. (126381)
101 cross-sectional studies/ (145483)
102 or/90-101 (1609864)
103 exp intervention studies/ (5473)
104 Comparative Study/ (1598341)
105 exp control groups/ (1360)
106 trial*.tw. (509732)

Page 3 of 4



Diane Bunn, 16/04/2012

107 (((nonequivalent or non equivalent) adj3 control*) or posttest* or post test* or pretest* or pre test* or quasi experiment* or quasiexperiment* or time series or timeseries).tw. (31465)

108 epidemiologic research design/ or control groups/ or cross-over studies/ (33374)

109 "cross over study".tw. (5331)

110 "crossover study".tw. (11891)

111 "cross over studies".tw. (287)

112 "crossover studies".tw. (686)

113 ((comparative or cluster) adj (study or studies)).tw. (65680)

114 (experiment* adj (study or studies)).tw. (62601)

115 (prospective adj (study or studies)).tw. (99923)

116 rct*.tw. (11773)

117 89 or 102 or 103 or 104 or 105 or 106 or 107 or 108 or 109 or 110 or 111 or 112 or 113 or 114 or 115 or 116 (3743653)

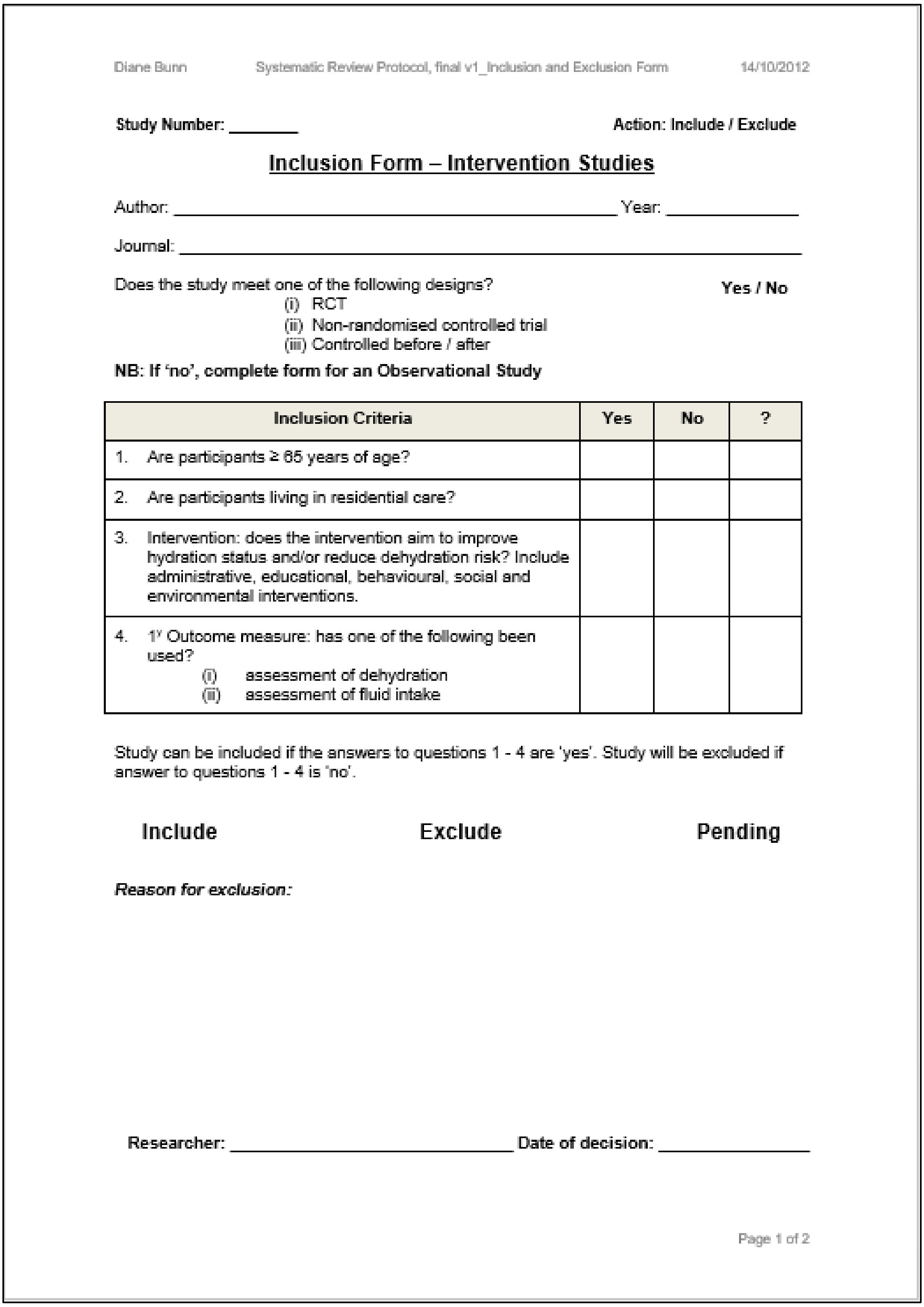
118 60 and 117 (673)

119 alcohol*.ti. (91532)

120 118 not 119 (576)

Page 4 of 4

Appendix 11: Systematic Review Inclusion Form



Diane Bunn Systematic Review Protocol, final v1_Inclusion and Exclusion Form 14/10/2012

Study Number: ________ **Action: Include / Exclude**

Inclusion Form – Intervention Studies

Author: ______________________________________ Year: __________

Journal: ____

Does the study meet one of the following designs? **Yes / No**

(i) RCT
(ii) Non-randomised controlled trial
(iii) Controlled before / after

NB: If 'no', complete form for an Observational Study

Inclusion Criteria	Yes	No	?
1. Are participants ≥ 65 years of age?			
2. Are participants living in residential care?			
3. Intervention: does the intervention aim to improve hydration status and/or reduce dehydration risk? Include administrative, educational, behavioural, social and environmental interventions.			
4. 1^Y Outcome measure: has one of the following been used? (i) assessment of dehydration (ii) assessment of fluid intake			

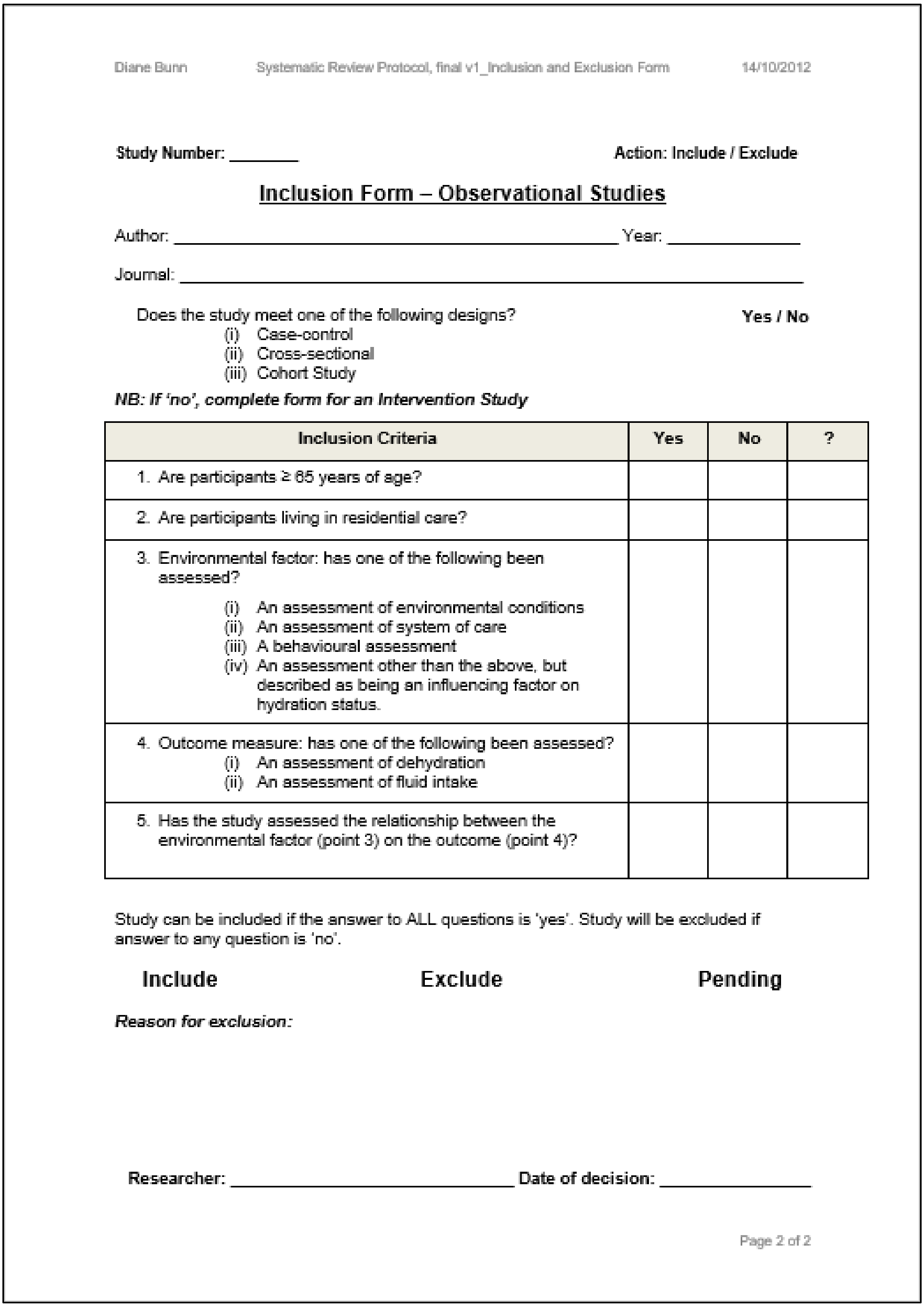
Study can be included if the answers to questions 1 - 4 are 'yes'. Study will be excluded if answer to questions 1 - 4 is 'no'.

Include **Exclude** **Pending**

Reason for exclusion:

Researcher: ________________________ **Date of decision:** ____________

Page 1 of 2



Diane Bunn Systematic Review Protocol, final v1_Inclusion and Exclusion Form 14/10/2012

Study Number: ________ **Action: Include / Exclude**

Inclusion Form – Observational Studies

Author: ____ Year: _____________

Journal: ____

Does the study meet one of the following designs? **Yes / No**

- (i) Case-control
- (ii) Cross-sectional
- (iii) Cohort Study

NB: If 'no', complete form for an Intervention Study

Inclusion Criteria	Yes	No	?
1. Are participants ≥ 65 years of age?			
2. Are participants living in residential care?			
3. Environmental factor: has one of the following been assessed? (i) An assessment of environmental conditions (ii) An assessment of system of care (iii) A behavioural assessment (iv) An assessment other than the above, but described as being an influencing factor on hydration status.			
4. Outcome measure: has one of the following been assessed? (i) An assessment of dehydration (ii) An assessment of fluid intake			
5. Has the study assessed the relationship between the environmental factor (point 3) on the outcome (point 4)?			

Study can be included if the answer to ALL questions is 'yes'. Study will be excluded if answer to any question is 'no'.

Include **Exclude** **Pending**

Reason for exclusion:

Researcher: ____________________________ **Date of decision:** _______________

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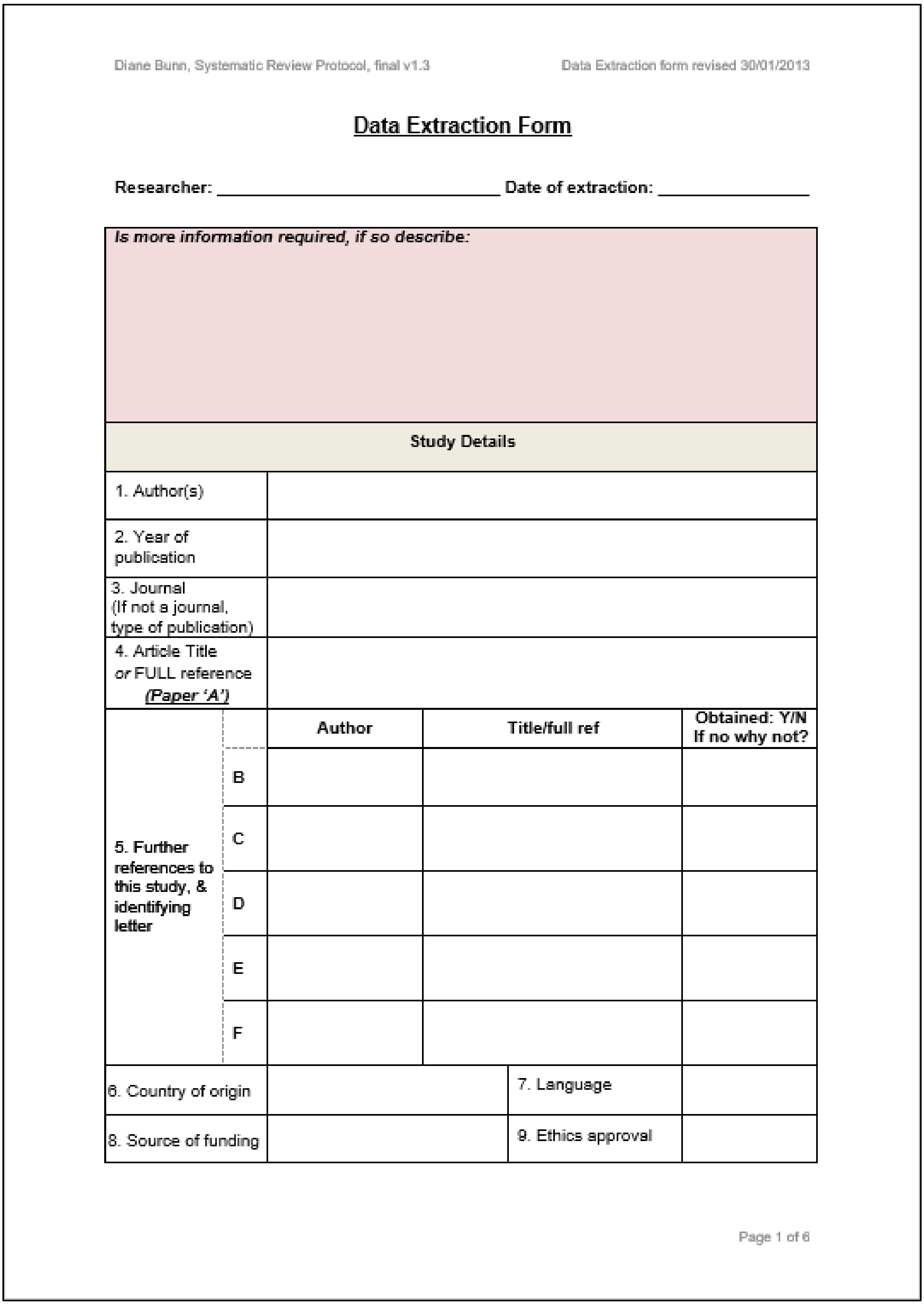
Appendix 12: Systematic Review Data Extraction Form



Diane Bunn, Systematic Review Protocol, final v1.3

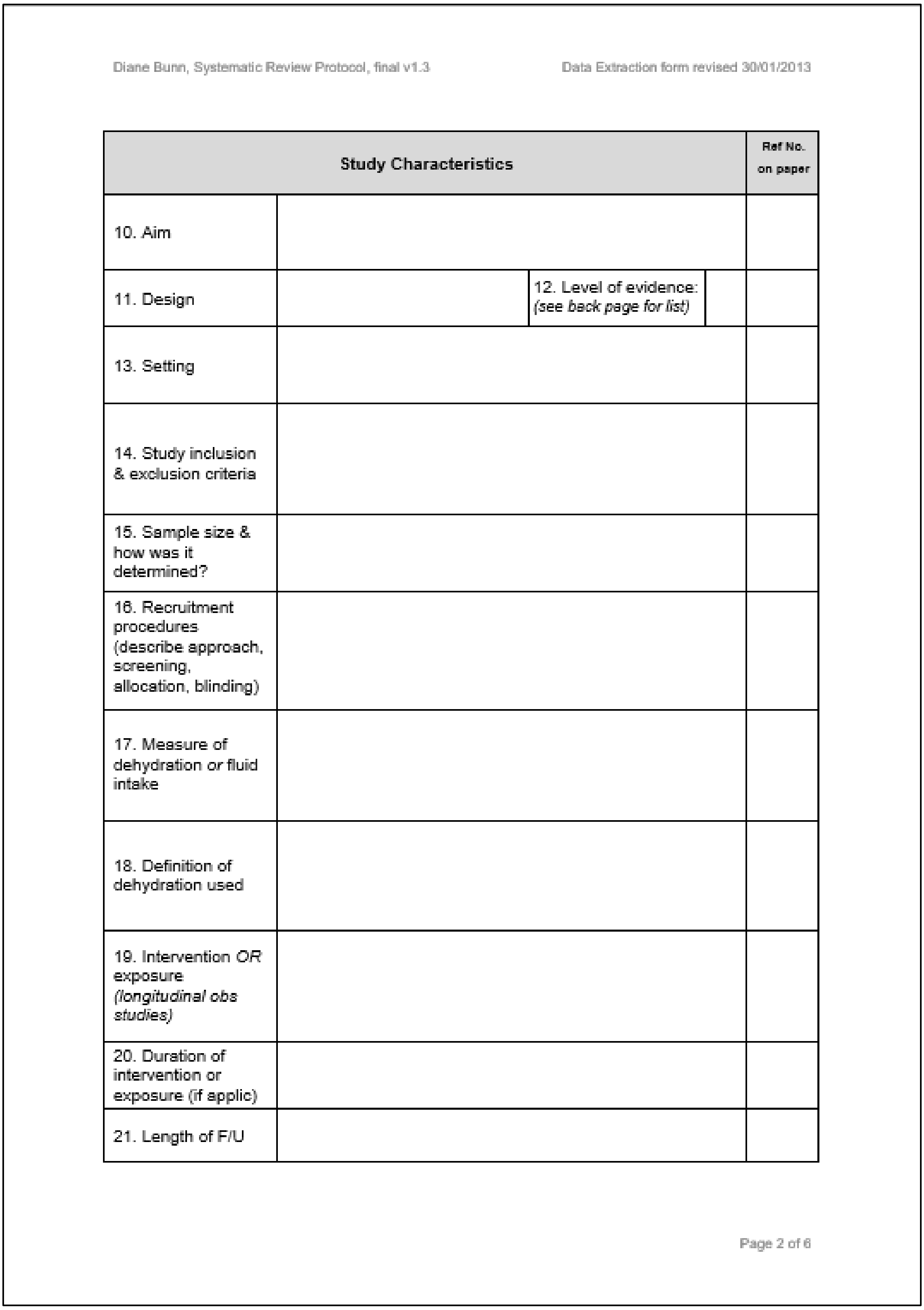
Data Extraction form revised 30/01/2013

Data Extraction Form

Researcher: ______________________________ **Date of extraction:** ________________

Is more information required, if so describe:				
Study Details				
1. Author(s)				
2. Year of publication				
3. Journal (If not a journal, type of publication)				
4. Article Title *or* FULL reference *(Paper 'A')*				
5. Further references to this study, & identifying letter		**Author**	**Title/full ref**	**Obtained: Y/N If no why not?**
	B			
	C			
	D			
	E			
	F			
6. Country of origin			7. Language	
8. Source of funding			9. Ethics approval	

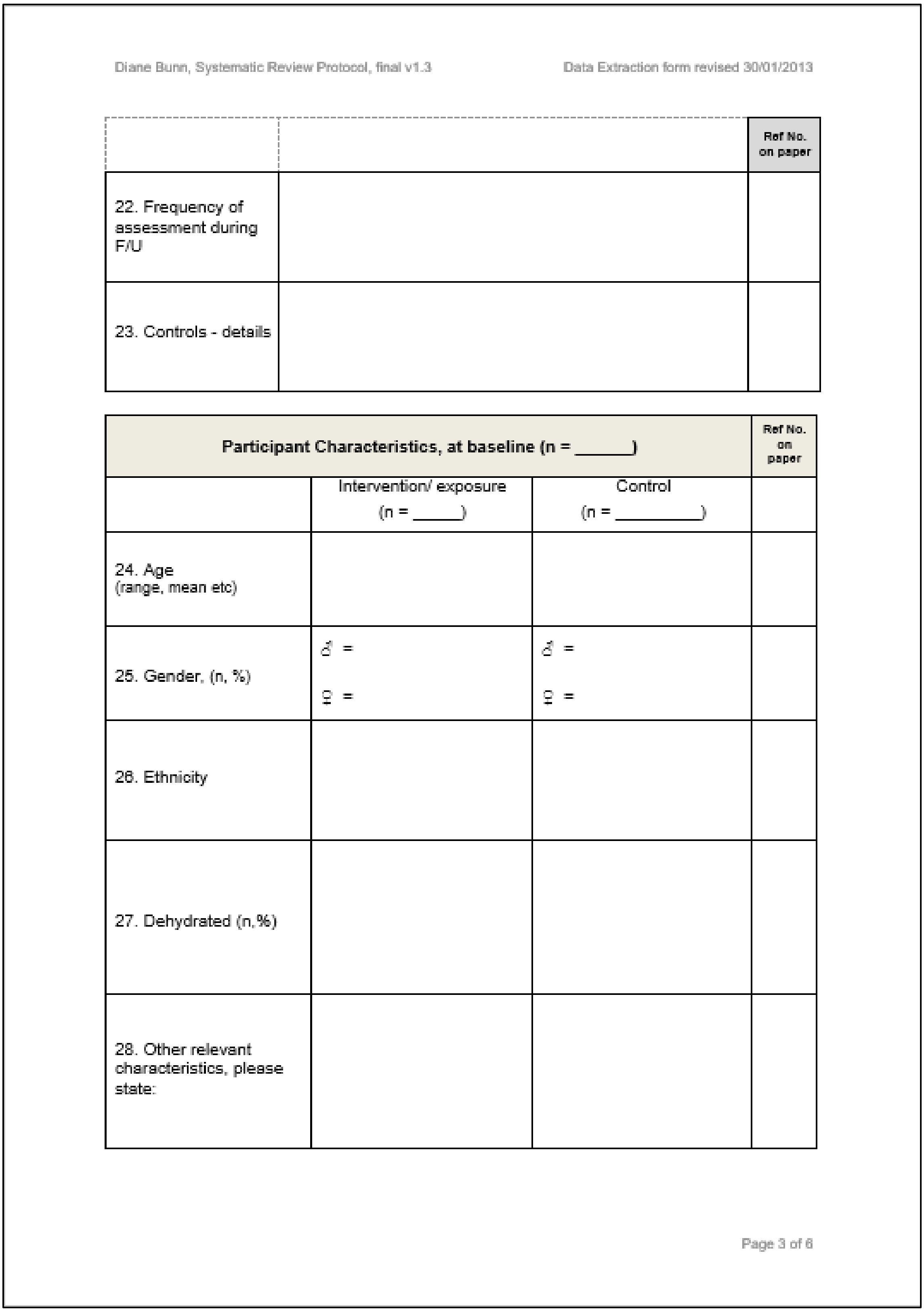
Page 1 of 6



Diane Bunn, Systematic Review Protocol, final v1.3 Data Extraction form revised 30/01/2013

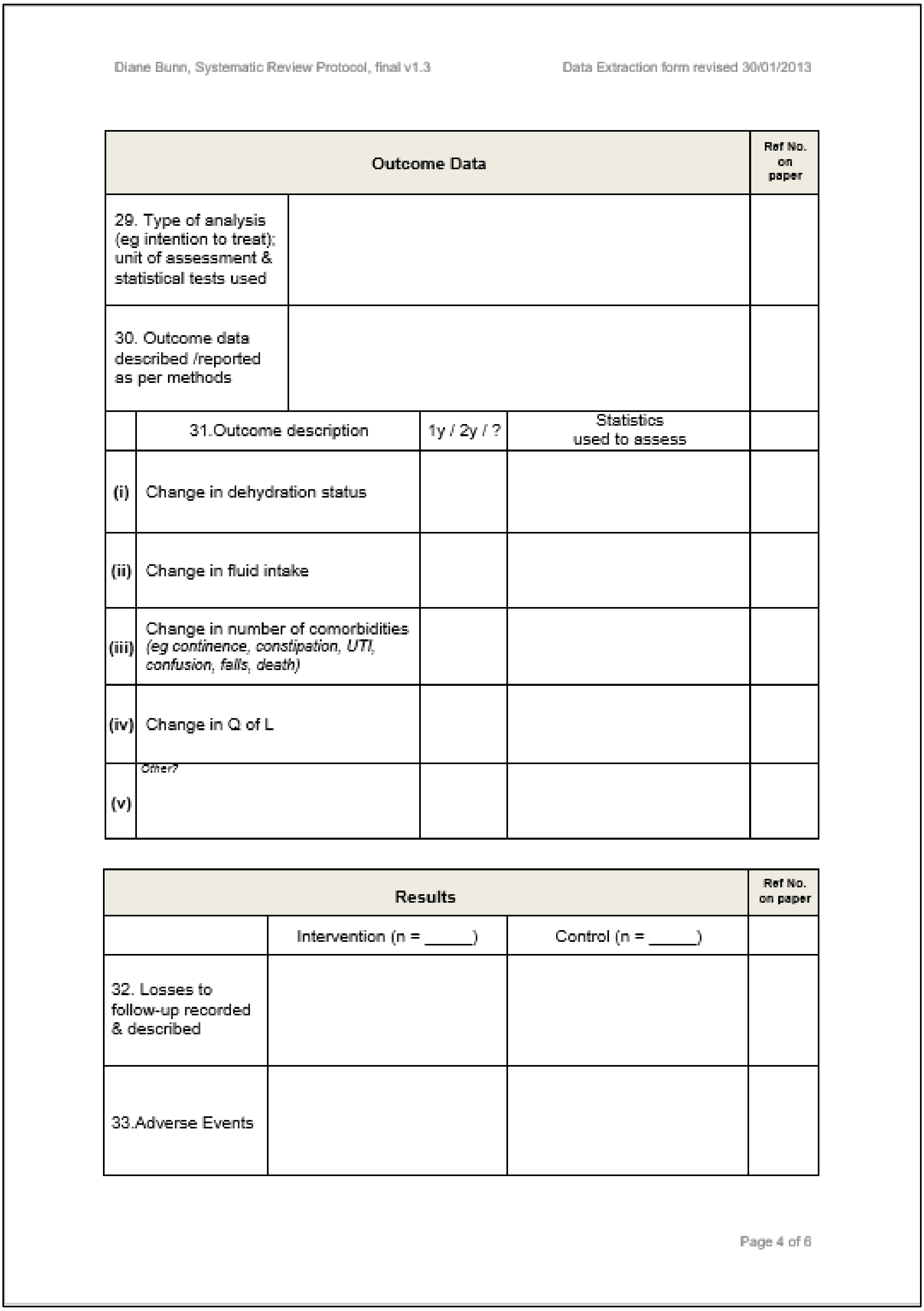
Study Characteristics		**Ref No. on paper**
10. Aim		
11. Design	12. Level of evidence: *(see back page for list)*	
13. Setting		
14. Study inclusion & exclusion criteria		
15. Sample size & how was it determined?		
16. Recruitment procedures (describe approach, screening, allocation, blinding)		
17. Measure of dehydration *or* fluid intake		
18. Definition of dehydration used		
19. Intervention *OR* exposure *(longitudinal obs studies)*		
20. Duration of intervention or exposure (if applic)		
21. Length of F/U		

Page 2 of 6



		Ref No. on paper
22. Frequency of assessment during F/U		
23. Controls - details		

Participant Characteristics, at baseline (n = ______)			Ref No. on paper
	Intervention/ exposure (n = ______)	Control (n = __________)	
24. Age (range, mean etc)			
25. Gender, (n, %)	♂ = ♀ =	♂ = ♀ =	
26. Ethnicity			
27. Dehydrated (n,%)			
28. Other relevant characteristics, please state:			

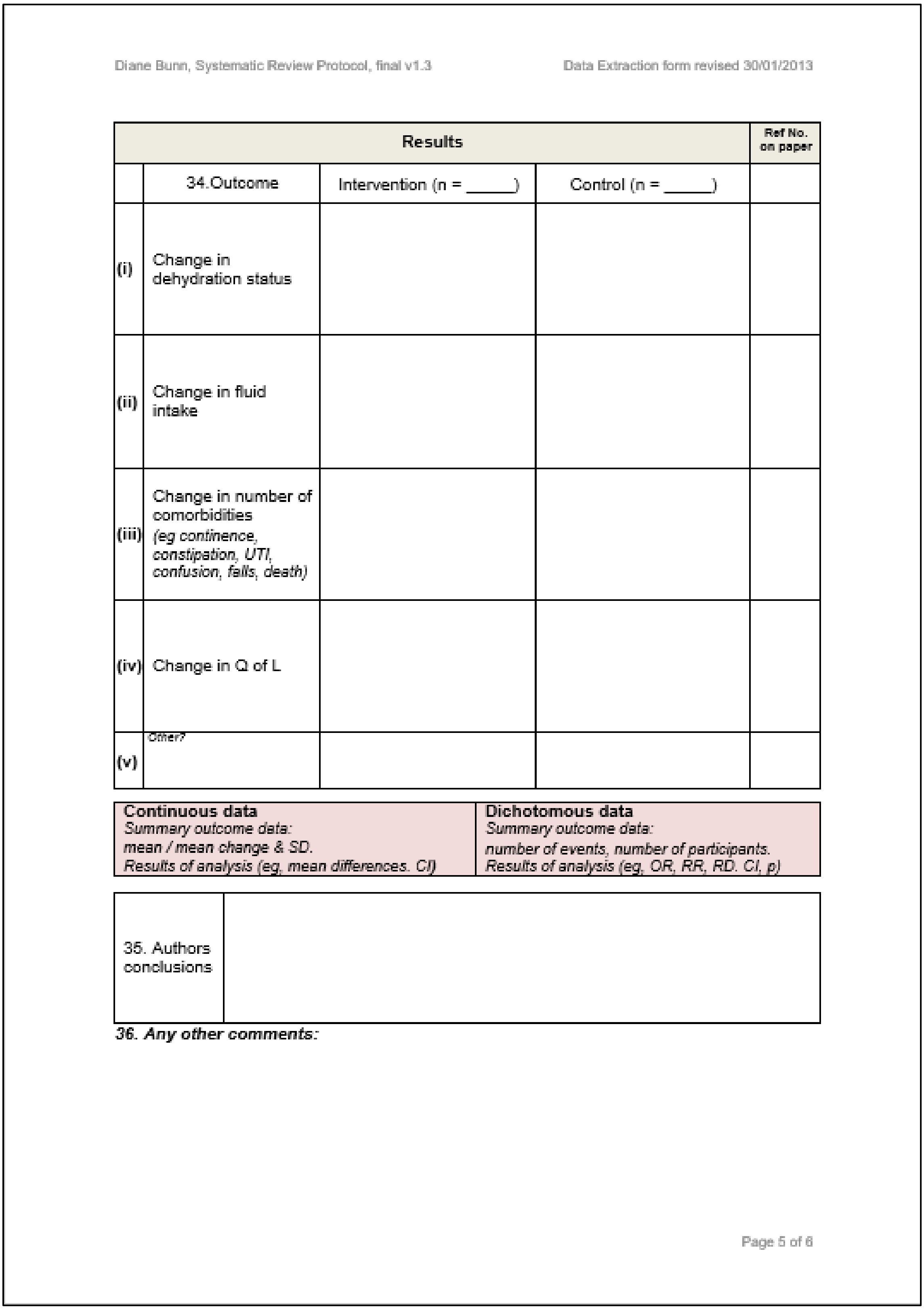


Diane Bunn, Systematic Review Protocol, final v1.3 Data Extraction form revised 30/01/2013

Outcome Data				Ref No. on paper
29. Type of analysis (eg intention to treat); unit of assessment & statistical tests used				
30. Outcome data described /reported as per methods				
	31.Outcome description	1y / 2y / ?	Statistics used to assess	
(i)	Change in dehydration status			
(ii)	Change in fluid intake			
(iii)	Change in number of comorbidities *(eg continence, constipation, UTI, confusion, falls, death)*			
(iv)	Change in Q of L			
(v)	Other?			

Results			Ref No. on paper
	Intervention (n = _____)	Control (n = _____)	
32. Losses to follow-up recorded & described			
33.Adverse Events			

Page 4 of 6



Diane Bunn, Systematic Review Protocol, final v1.3 Data Extraction form revised 30/01/2013

Results				Ref No. on paper
	34.Outcome	Intervention (n = ______)	Control (n = ______)	
(i)	Change in dehydration status			
(ii)	Change in fluid intake			
(iii)	Change in number of comorbidities *(eg continence, constipation, UTI, confusion, falls, death)*			
(iv)	Change in Q of L			
(v)	*Other?*			

Continuous data *Summary outcome data:* *mean / mean change & SD.* *Results of analysis (eg, mean differences. CI)*	**Dichotomous data** *Summary outcome data:* *number of events, number of participants.* *Results of analysis (eg, OR, RR, RD. CI, p)*

35. Authors conclusions	

36. Any other comments:

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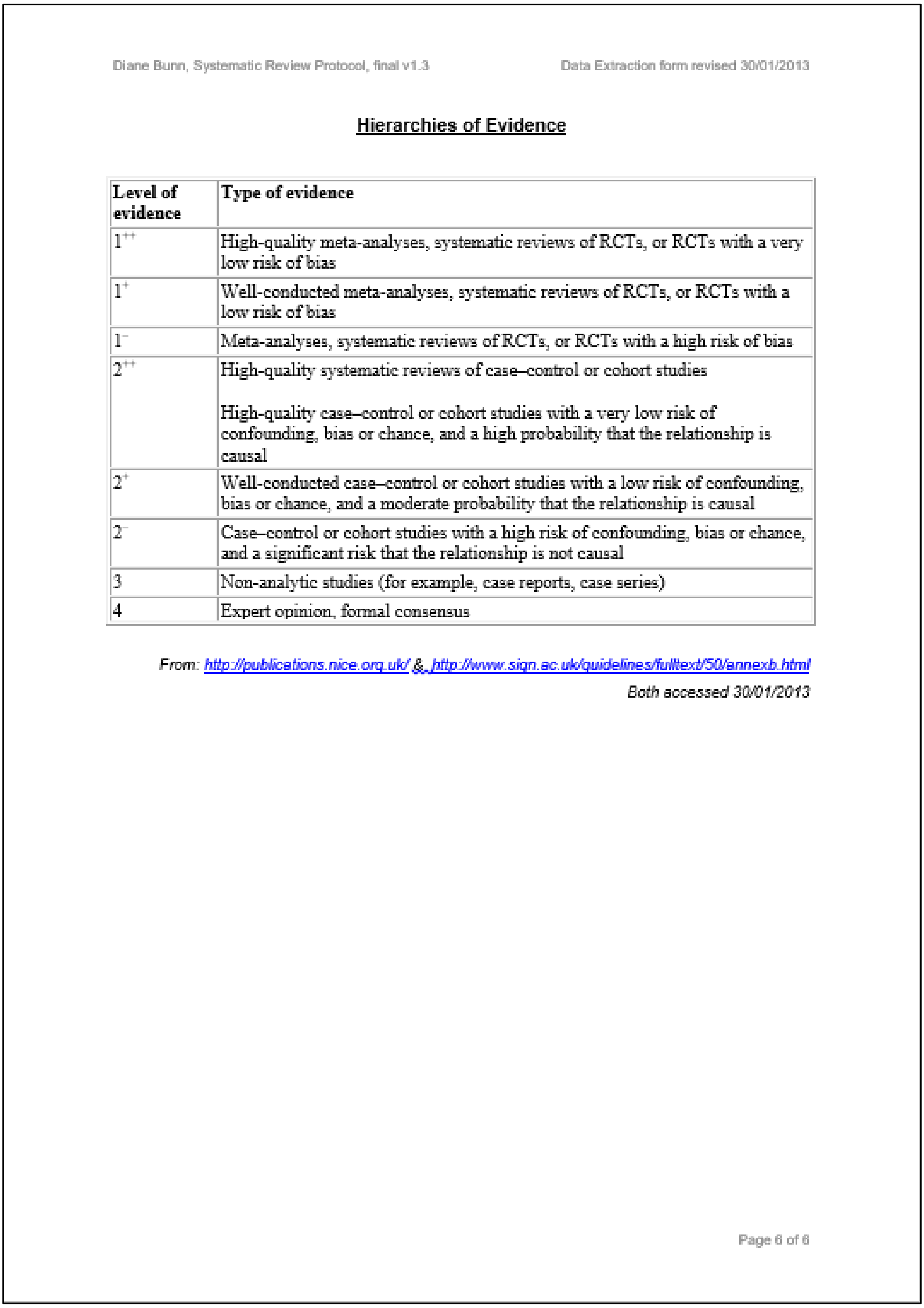


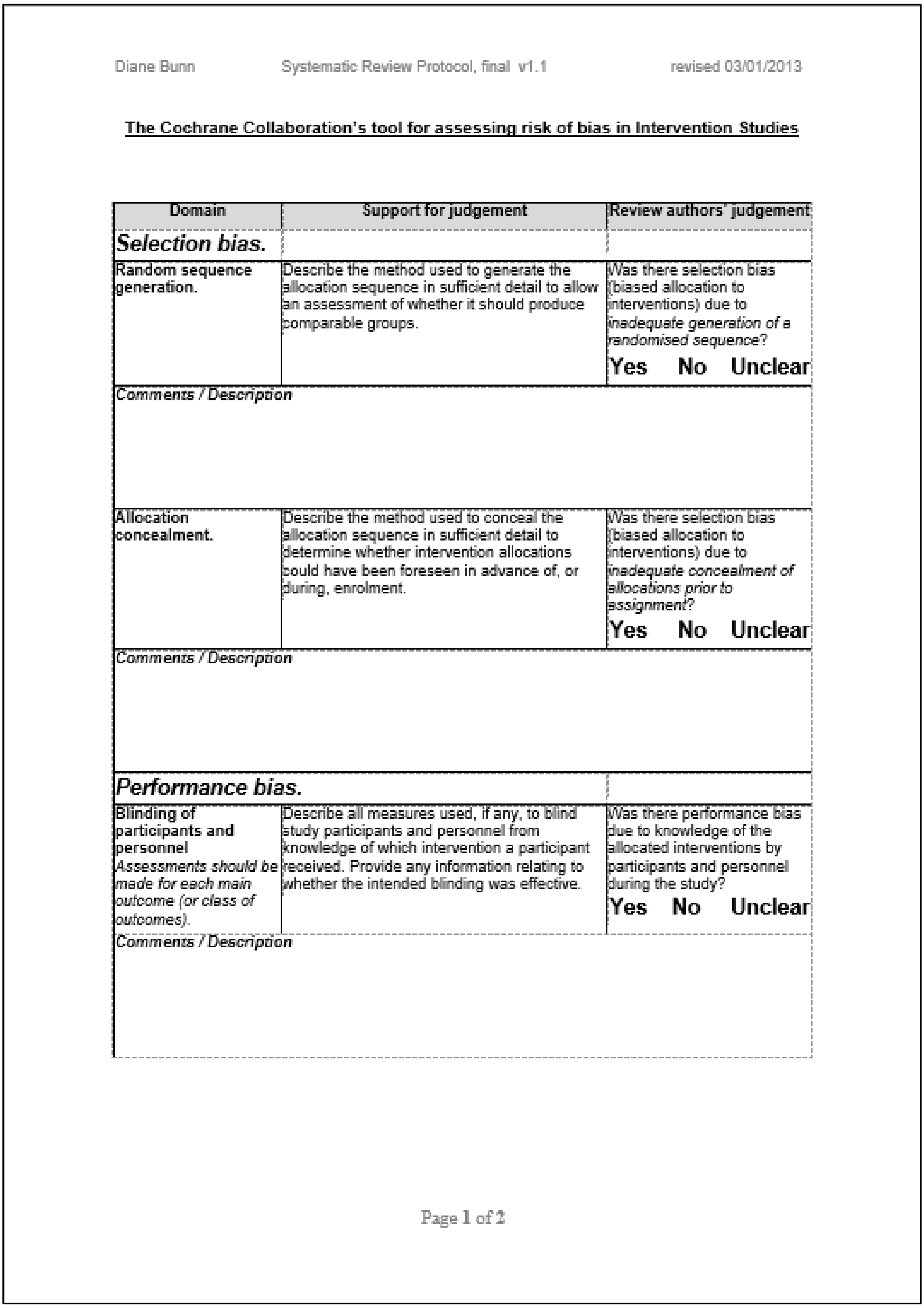
Hierarchies of Evidence

Level of evidence	**Type of evidence**
1^{++}	High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1^{+}	Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias
2^{++}	High-quality systematic reviews of case–control or cohort studies High-quality case–control or cohort studies with a very low risk of confounding, bias or chance, and a high probability that the relationship is causal
2^{+}	Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance, and a moderate probability that the relationship is causal
2^{-}	Case–control or cohort studies with a high risk of confounding, bias or chance, and a significant risk that the relationship is not causal
3	Non-analytic studies (for example, case reports, case series)
4	Expert opinion, formal consensus

From: http://publications.nice.org.uk/ & http://www.sign.ac.uk/guidelines/fulltext/50/annexb.html

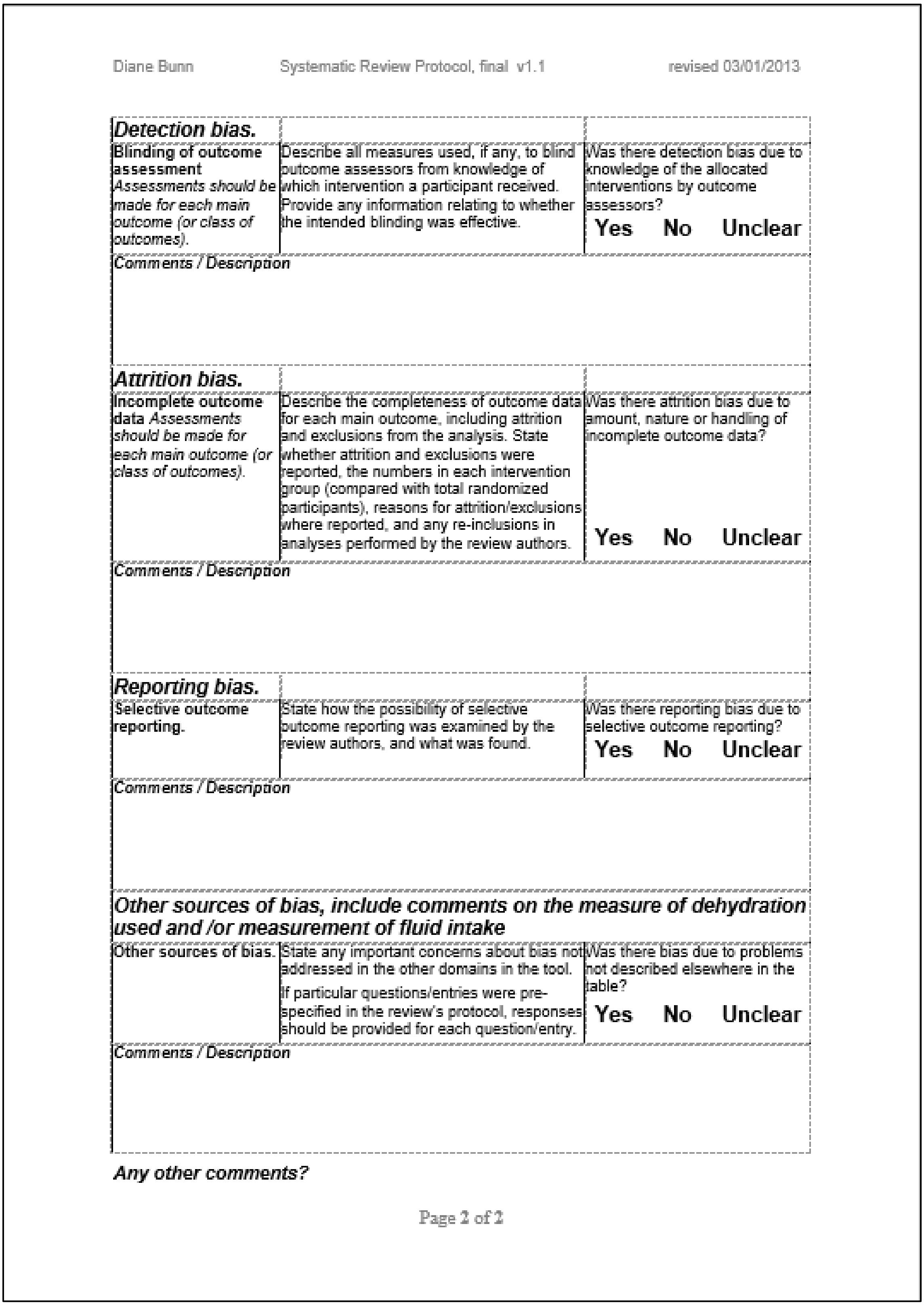
Both accessed 30/01/2013

Appendix 13: Systematic Review SR Cochrane Risk of Bias Form



The Cochrane Collaboration's tool for assessing risk of bias in Intervention Studies

Domain	Support for judgement	Review authors' judgement
Selection bias.		
Random sequence generation.	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.	Was there selection bias (biased allocation to interventions) due to *inadequate generation of a randomised sequence*? **Yes No Unclear**
Comments / Description		
Allocation concealment.	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.	Was there selection bias (biased allocation to interventions) due to *inadequate concealment of allocations prior to assignment?* **Yes No Unclear**
Comments / Description		
Performance bias.		
Blinding of participants and personnel *Assessments should be made for each main outcome (or class of outcomes).*	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Was there performance bias due to knowledge of the allocated interventions by participants and personnel during the study? **Yes No Unclear**
Comments / Description		



Diane Bunn Systematic Review Protocol, final v1.1 revised 03/01/2013

Detection bias.		
Blinding of outcome assessment *Assessments should be made for each main outcome (or class of outcomes).*	Describe all measures used, if any, to blind outcome assessors from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Was there detection bias due to knowledge of the allocated interventions by outcome assessors? **Yes No Unclear**
Comments / Description		
Attrition bias.		
Incomplete outcome data *Assessments should be made for each main outcome (or class of outcomes).*	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Was there attrition bias due to amount, nature or handling of incomplete outcome data? **Yes No Unclear**
Comments / Description		
Reporting bias.		
Selective outcome reporting.	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	Was there reporting bias due to selective outcome reporting? **Yes No Unclear**
Comments / Description		
Other sources of bias, include comments on the measure of dehydration used and /or measurement of fluid intake		
Other sources of bias.	State any important concerns about bias not addressed in the other domains in the tool. If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry.	Was there bias due to problems not described elsewhere in the table? **Yes No Unclear**
Comments / Description		

Any other comments?

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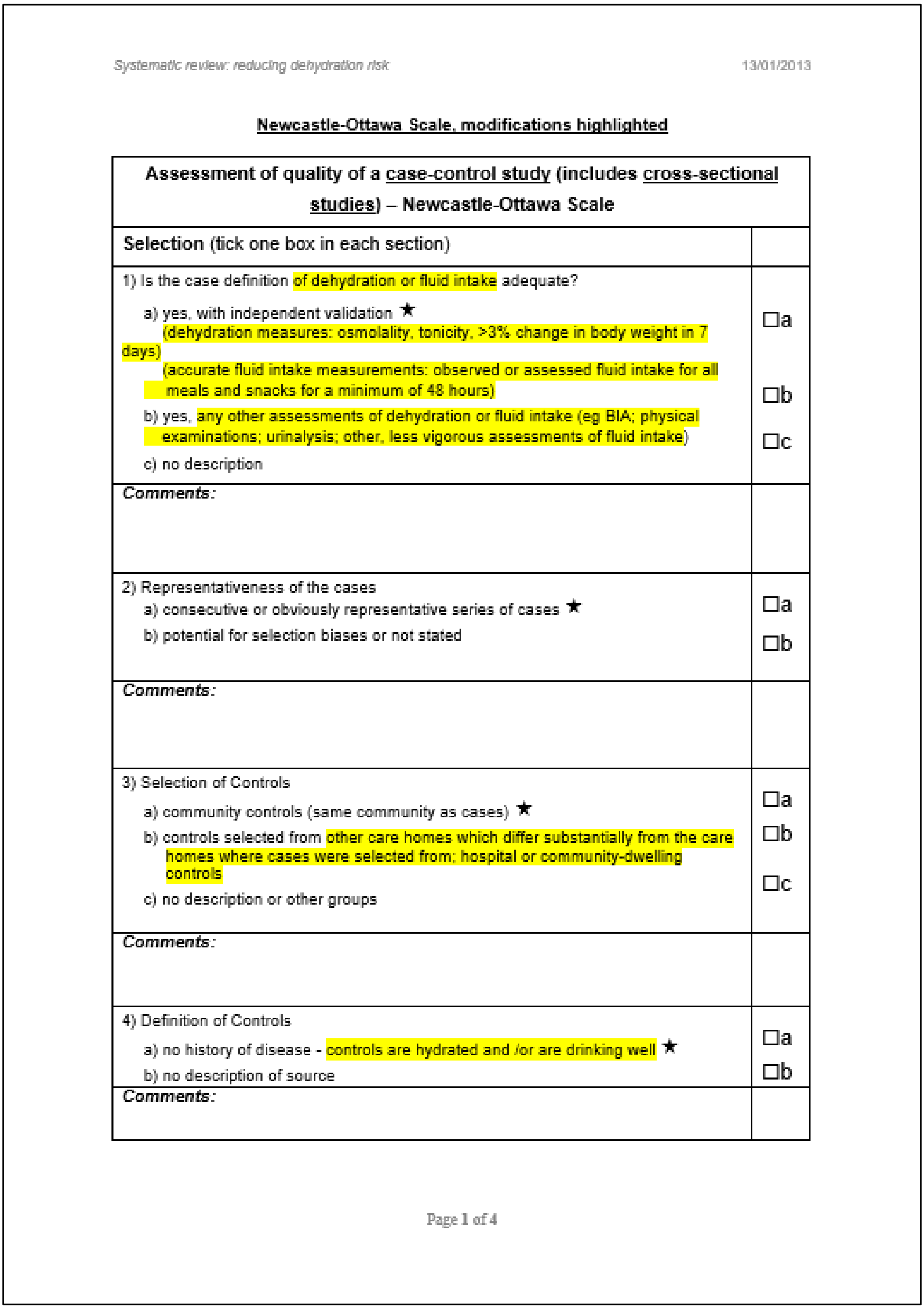
Appendix 14: Newcastle-Ottawa Risk of Bias Form



Systematic review: reducing dehydration risk 13/01/2013

Newcastle-Ottawa Scale, modifications highlighted

Assessment of quality of a case-control study (includes cross-sectional studies) – Newcastle-Ottawa Scale	
Selection (tick one box in each section)	
1) Is the case definition of dehydration or fluid intake adequate? a) yes, with independent validation ★ (dehydration measures: osmolality, tonicity, >3% change in body weight in 7 days) (accurate fluid intake measurements: observed or assessed fluid intake for all meals and snacks for a minimum of 48 hours) b) yes, any other assessments of dehydration or fluid intake (eg BIA; physical examinations; urinalysis; other, less vigorous assessments of fluid intake) c) no description	☐a ☐b ☐c
Comments:	
2) Representativeness of the cases a) consecutive or obviously representative series of cases ★ b) potential for selection biases or not stated	☐a ☐b
Comments:	
3) Selection of Controls a) community controls (same community as cases) ★ b) controls selected from other care homes which differ substantially from the care homes where cases were selected from; hospital or community-dwelling controls c) no description or other groups	☐a ☐b ☐c
Comments:	
4) Definition of Controls a) no history of disease - controls are hydrated and /or are drinking well ★ b) no description of source	☐a ☐b
Comments:	

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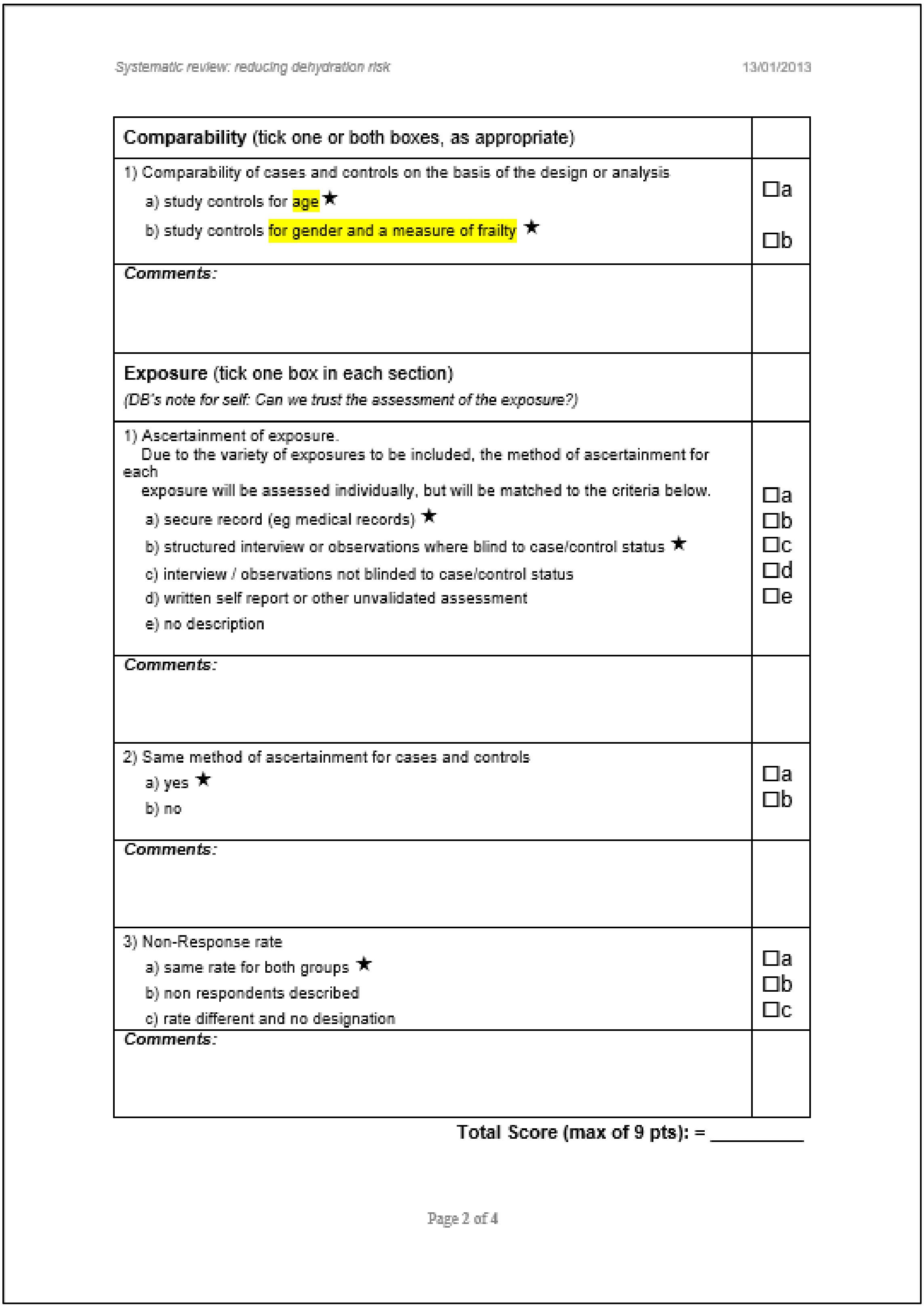
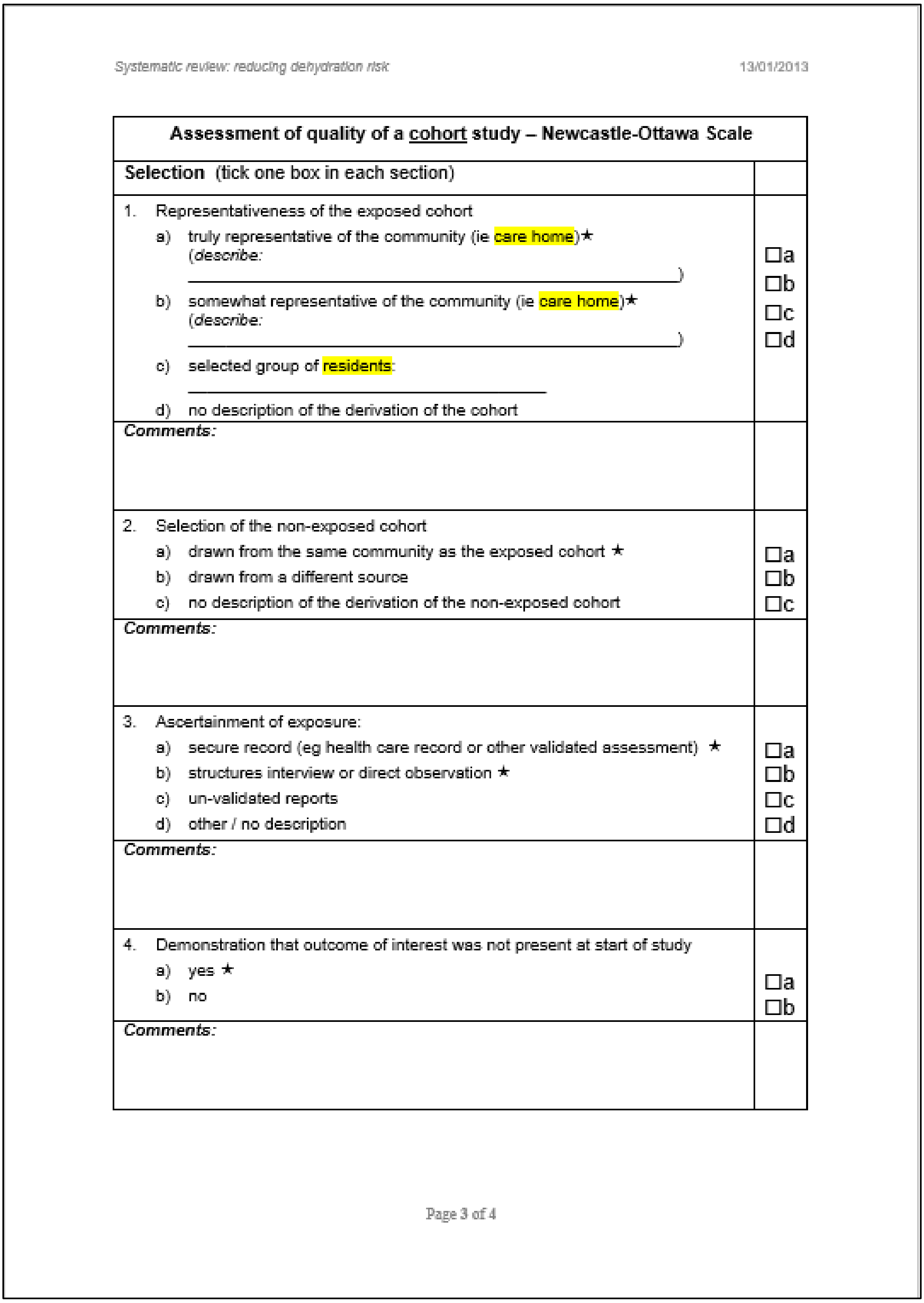


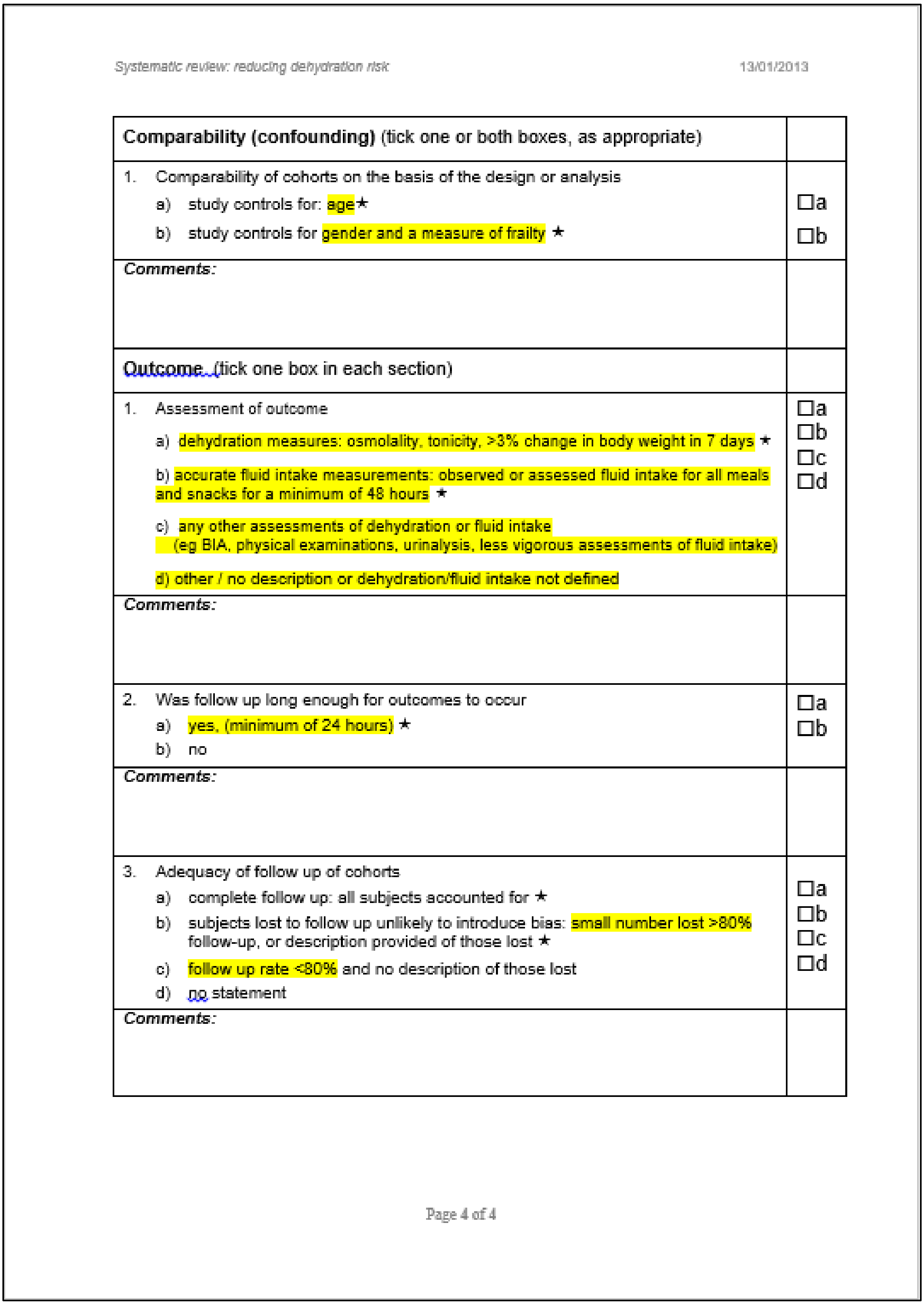
Comparability (tick one or both boxes, as appropriate)	
1) Comparability of cases and controls on the basis of the design or analysis a) study controls for age ★ b) study controls for gender and a measure of frailty ★	☐a ☐b
Comments:	
Exposure (tick one box in each section) *(DB's note for self: Can we trust the assessment of the exposure?)*	
1) Ascertainment of exposure. Due to the variety of exposures to be included, the method of ascertainment for each exposure will be assessed individually, but will be matched to the criteria below. a) secure record (eg medical records) ★ b) structured interview or observations where blind to case/control status ★ c) interview / observations not blinded to case/control status d) written self report or other unvalidated assessment e) no description	☐a ☐b ☐c ☐d ☐e
Comments:	
2) Same method of ascertainment for cases and controls a) yes ★ b) no	☐a ☐b
Comments:	
3) Non-Response rate a) same rate for both groups ★ b) non respondents described c) rate different and no designation	☐a ☐b ☐c
Comments:	

Total Score (max of 9 pts): = __________



Assessment of quality of a cohort study – Newcastle-Ottawa Scale

Selection (tick one box in each section)	
1. Representativeness of the exposed cohort a) truly representative of the community (ie care home)★ (*describe:* ______________________________) b) somewhat representative of the community (ie care home)★ (*describe:* ______________________________) c) selected group of residents: ______________________ d) no description of the derivation of the cohort	☐a ☐b ☐c ☐d
Comments:	
2. Selection of the non-exposed cohort a) drawn from the same community as the exposed cohort ★ b) drawn from a different source c) no description of the derivation of the non-exposed cohort	☐a ☐b ☐c
Comments:	
3. Ascertainment of exposure: a) secure record (eg health care record or other validated assessment) ★ b) structures interview or direct observation ★ c) un-validated reports d) other / no description	☐a ☐b ☐c ☐d
Comments:	
4. Demonstration that outcome of interest was not present at start of study a) yes ★ b) no	☐a ☐b
Comments:	



Comparability (confounding) (tick one or both boxes, as appropriate)	
1. Comparability of cohorts on the basis of the design or analysis a) study controls for: age★ b) study controls for gender and a measure of frailty ★	☐a ☐b
Comments:	
Outcome (tick one box in each section)	
1. Assessment of outcome a) dehydration measures: osmolality, tonicity, >3% change in body weight in 7 days ★ b) accurate fluid intake measurements: observed or assessed fluid intake for all meals and snacks for a minimum of 48 hours ★ c) any other assessments of dehydration or fluid intake (eg BIA, physical examinations, urinalysis, less vigorous assessments of fluid intake) d) other / no description or dehydration/fluid intake not defined	☐a ☐b ☐c ☐d
Comments:	
2. Was follow up long enough for outcomes to occur a) yes, (minimum of 24 hours) ★ b) no	☐a ☐b
Comments:	
3. Adequacy of follow up of cohorts a) complete follow up: all subjects accounted for ★ b) subjects lost to follow up unlikely to introduce bias: small number lost >80% follow-up, or description provided of those lost ★ c) follow up rate <80% and no description of those lost d) no statement	☐a ☐b ☐c ☐d
Comments:	

Appendix 15: COREQ Checklist

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from:
Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

YOU MUST PROVIDE A RESPONSE FOR ALL ITEMS. ENTER N/A IF NOT APPLICABLE

No. Item	**Guide questions/description**	**Reported on section**
Domain 1: Research team and reflexivity		
Personal Characteristics		
1. Interviewer/facilitator	Which author/s conducted the interview or focus group?	6.1
2. Credentials	What were the researcher's credentials? E.g. PhD, MD	6.3.1
3. Occupation	What was their occupation at the time of the study?	6.3.1
4. Gender	Was the researcher male or female?	Title Page
5. Experience and training	What experience or training did the researcher have?	6.1; 6.3.1
Relationship with participants		
6. Relationship established	Was a relationship established prior to study commencement?	6.3.3
7. Participant knowledge of the interviewer	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	Appendices 18, 19
8. Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	6.3.1
Domain 2: study design		
Theoretical framework		
9. Methodological orientation and Theory	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	6.3
Participant selection		
10. Sampling	How were participants selected? e.g. purposive, convenience, consecutive, snowball	6.3.2.1
11. Method of approach	How were participants approached? e.g. face-to-face, telephone, mail, email	6.4.1

Page 1 of 2

12. Sample size	How many participants were in the study?	6.5.1
13. Non-participation	How many people refused to participate or dropped out? Reasons?	6.5.1
Setting		
14. Setting of data collection	Where was the data collected? e.g. home, clinic, workplace	6.5.1
15. Presence of non-participants	Was anyone else present besides the participants and researchers?	None
16. Description of sample	What are the important characteristics of the sample? e.g. demographic data, date	Table 6-2
Data collection		
17. Interview guide	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Appendix 22
18. Repeat interviews	Were repeat inter views carried out? If yes, how many?	N/A
19. Audio/visual recording	Did the research use audio or visual recording to collect the data?	6.4.2.1
20. Field notes	Were field notes made during and/or after the interview or focus group?	6.3.1; 6.4.2.1; 6.4.3
21. Duration	What was the duration of the inter views or focus group?	6.4.2.1
22. Data saturation	Was data saturation discussed?	6.6.3
23. Transcripts returned	Were transcripts returned to participants for comment and/or correction?	N/A
Domain 3: analysis and findings		
Data analysis		
24. Number of data coders	How many data coders coded the data?	6.4.3
25. Description of the coding tree	Did authors provide a description of the coding tree?	6.4.3
26. Derivation of themes	Were themes identified in advance or derived from the data?	6.4.3
27. Software	What software, if applicable, was used to manage the data?	6.4.3
28. Participant checking	Did participants provide feedback on the findings?	N/A
Reporting		
29. Quotations presented	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	6.5
30. Data and findings consistent	Was there consistency between the data presented and the findings?	6.6
31. Clarity of major themes	Were major themes clearly presented in the findings?	6.6
32. Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	6.6

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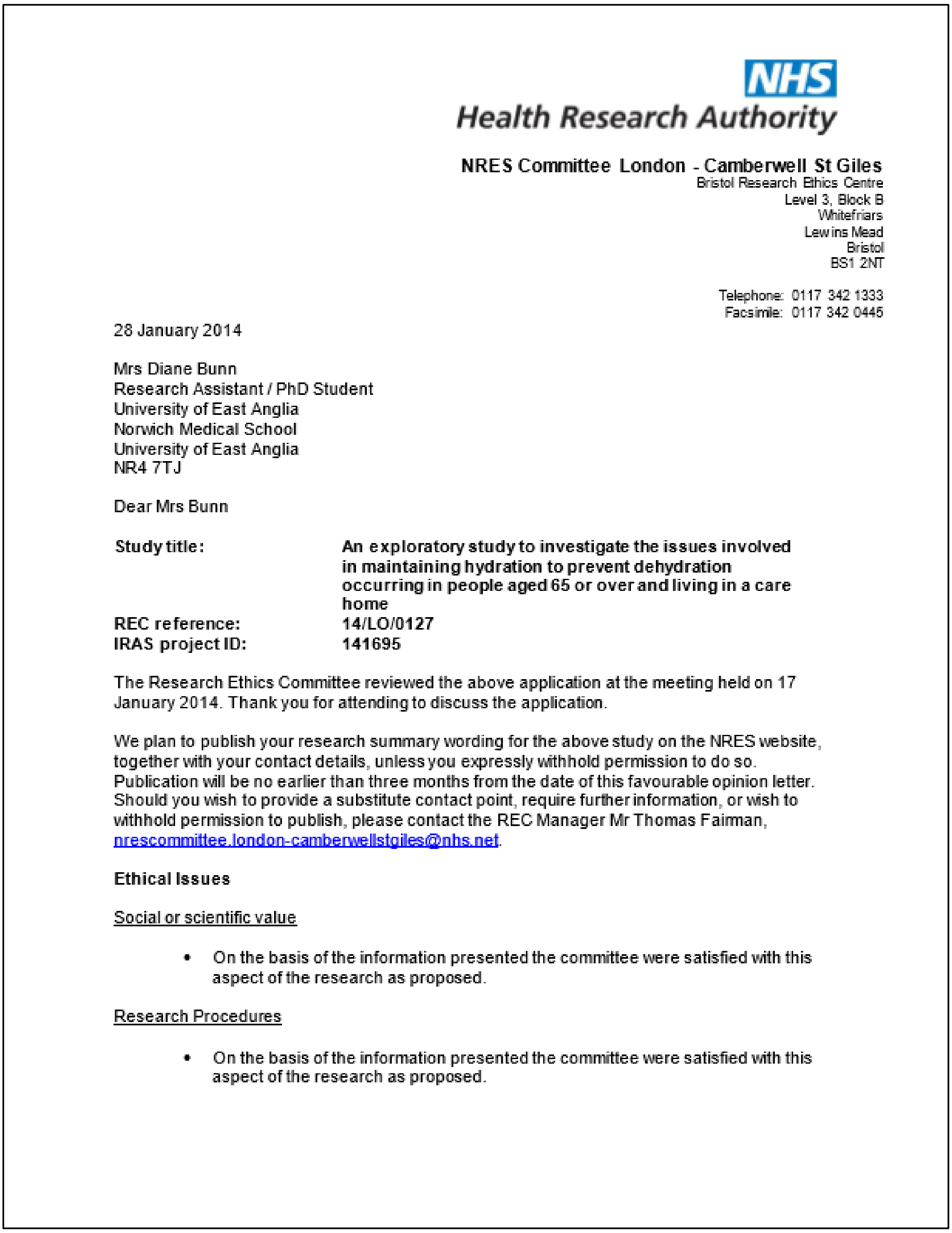
Appendix 16: Qualitative Study Ethics Approval Letter



NHS
Health Research Authority

NRES Committee London - Camberwell St Giles
Bristol Research Ethics Centre
Level 3, Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Telephone: 0117 342 1333
Facsimile: 0117 342 0445

28 January 2014

Mrs Diane Bunn
Research Assistant / PhD Student
University of East Anglia
Norwich Medical School
University of East Anglia
NR4 7TJ

Dear Mrs Bunn

Study title:	**An exploratory study to investigate the issues involved in maintaining hydration to prevent dehydration occurring in people aged 65 or over and living in a care home**
REC reference:	**14/LO/0127**
IRAS project ID:	**141695**

The Research Ethics Committee reviewed the above application at the meeting held on 17 January 2014. Thank you for attending to discuss the application.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the REC Manager Mr Thomas Fairman, nrescommittee.london-camberwellstgiles@nhs.net.

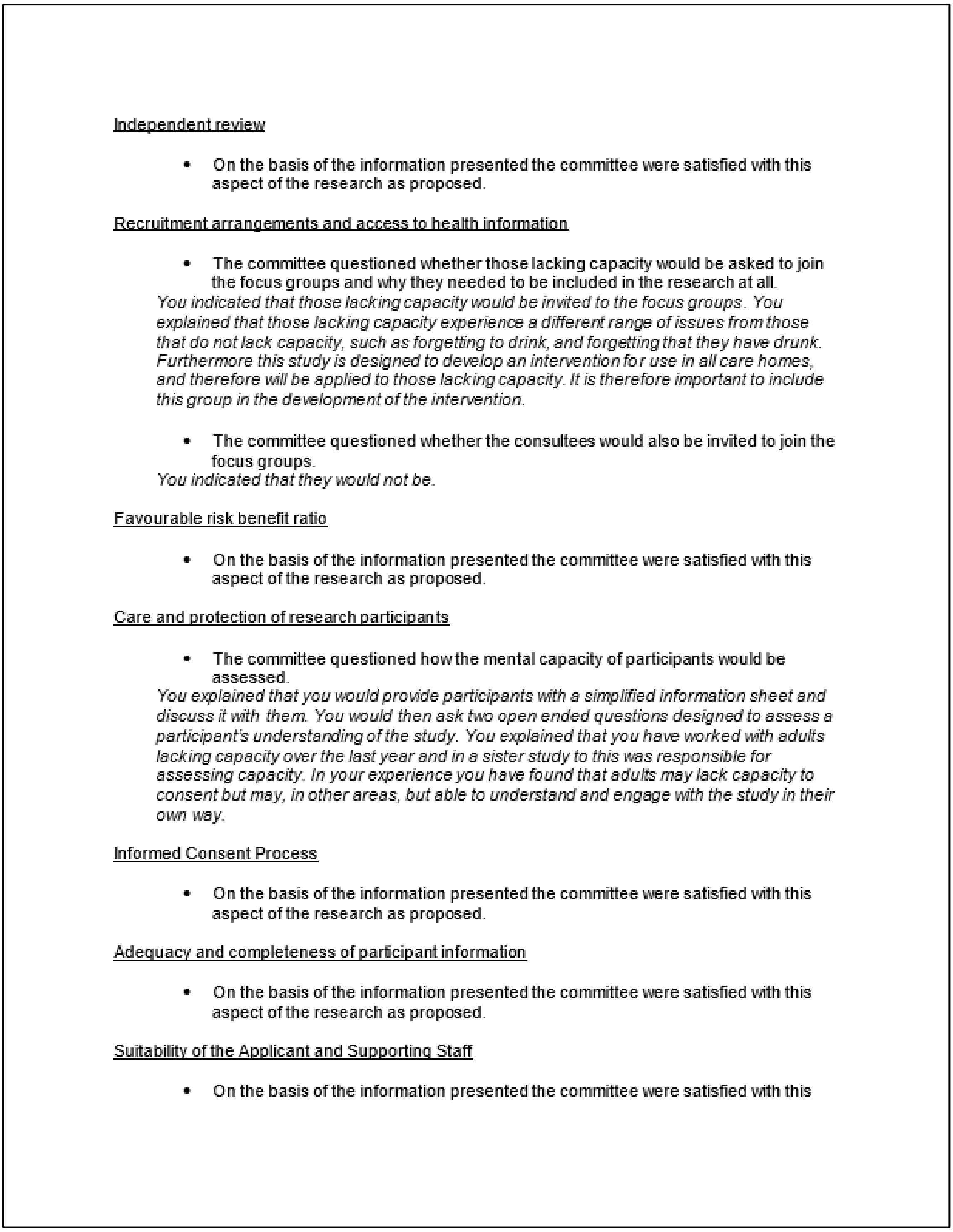
Ethical Issues

Social or scientific value

- On the basis of the information presented the committee were satisfied with this aspect of the research as proposed.

Research Procedures

- On the basis of the information presented the committee were satisfied with this aspect of the research as proposed.



Independent review

- On the basis of the information presented the committee were satisfied with this aspect of the research as proposed.

Recruitment arrangements and access to health information

- The committee questioned whether those lacking capacity would be asked to join the focus groups and why they needed to be included in the research at all.

You indicated that those lacking capacity would be invited to the focus groups. You explained that those lacking capacity experience a different range of issues from those that do not lack capacity, such as forgetting to drink, and forgetting that they have drunk. Furthermore this study is designed to develop an intervention for use in all care homes, and therefore will be applied to those lacking capacity. It is therefore important to include this group in the development of the intervention.

- The committee questioned whether the consultees would also be invited to join the focus groups.

You indicated that they would not be.

Favourable risk benefit ratio

- On the basis of the information presented the committee were satisfied with this aspect of the research as proposed.

Care and protection of research participants

- The committee questioned how the mental capacity of participants would be assessed.

You explained that you would provide participants with a simplified information sheet and discuss it with them. You would then ask two open ended questions designed to assess a participant's understanding of the study. You explained that you have worked with adults lacking capacity over the last year and in a sister study to this was responsible for assessing capacity. In your experience you have found that adults may lack capacity to consent but may, in other areas, but able to understand and engage with the study in their own way.

Informed Consent Process

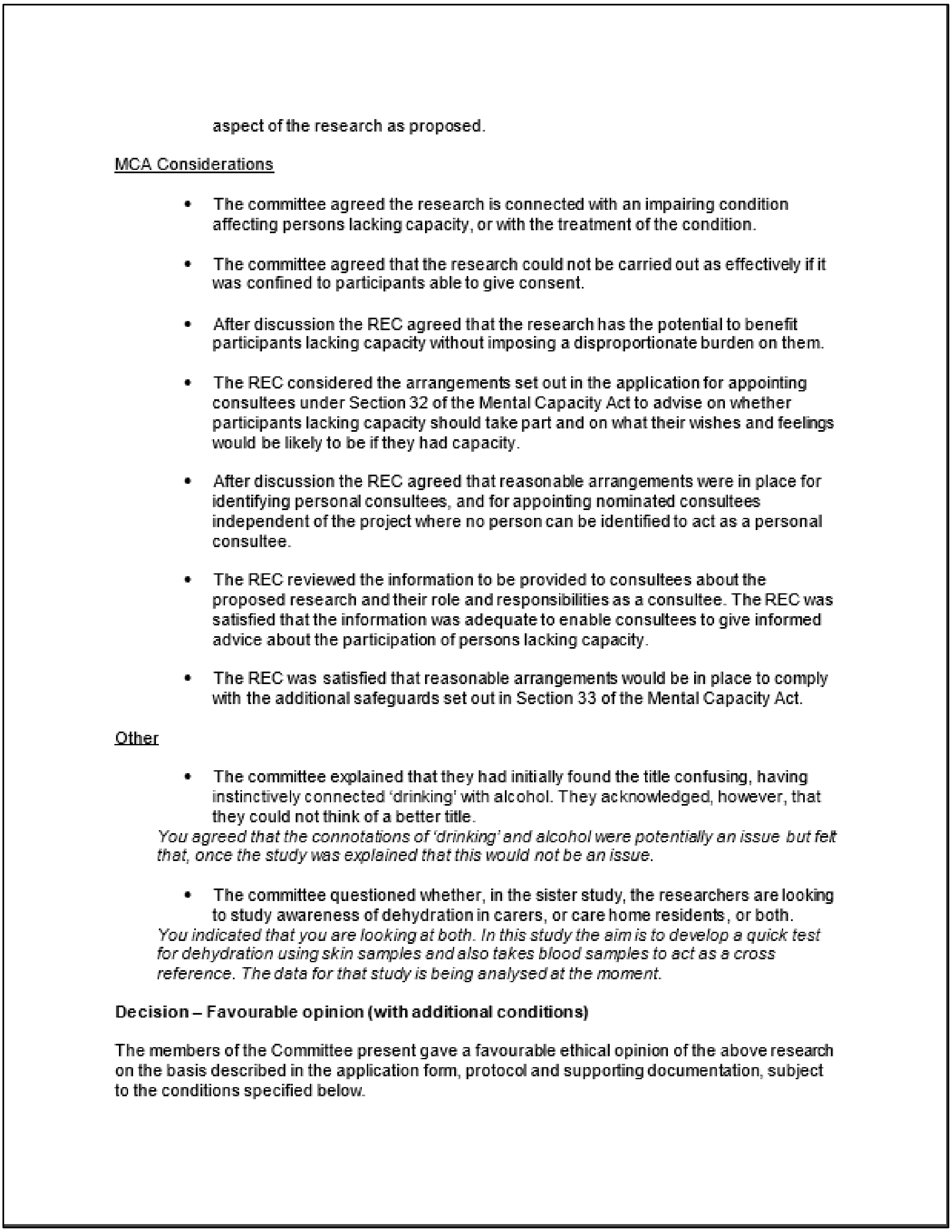
- On the basis of the information presented the committee were satisfied with this aspect of the research as proposed.

Adequacy and completeness of participant information

- On the basis of the information presented the committee were satisfied with this aspect of the research as proposed.

Suitability of the Applicant and Supporting Staff

- On the basis of the information presented the committee were satisfied with this



aspect of the research as proposed.

MCA Considerations

- The committee agreed the research is connected with an impairing condition affecting persons lacking capacity, or with the treatment of the condition.

- The committee agreed that the research could not be carried out as effectively if it was confined to participants able to give consent.

- After discussion the REC agreed that the research has the potential to benefit participants lacking capacity without imposing a disproportionate burden on them.

- The REC considered the arrangements set out in the application for appointing consultees under Section 32 of the Mental Capacity Act to advise on whether participants lacking capacity should take part and on what their wishes and feelings would be likely to be if they had capacity.

- After discussion the REC agreed that reasonable arrangements were in place for identifying personal consultees, and for appointing nominated consultees independent of the project where no person can be identified to act as a personal consultee.

- The REC reviewed the information to be provided to consultees about the proposed research and their role and responsibilities as a consultee. The REC was satisfied that the information was adequate to enable consultees to give informed advice about the participation of persons lacking capacity.

- The REC was satisfied that reasonable arrangements would be in place to comply with the additional safeguards set out in Section 33 of the Mental Capacity Act.

Other

- The committee explained that they had initially found the title confusing, having instinctively connected 'drinking' with alcohol. They acknowledged, however, that they could not think of a better title.

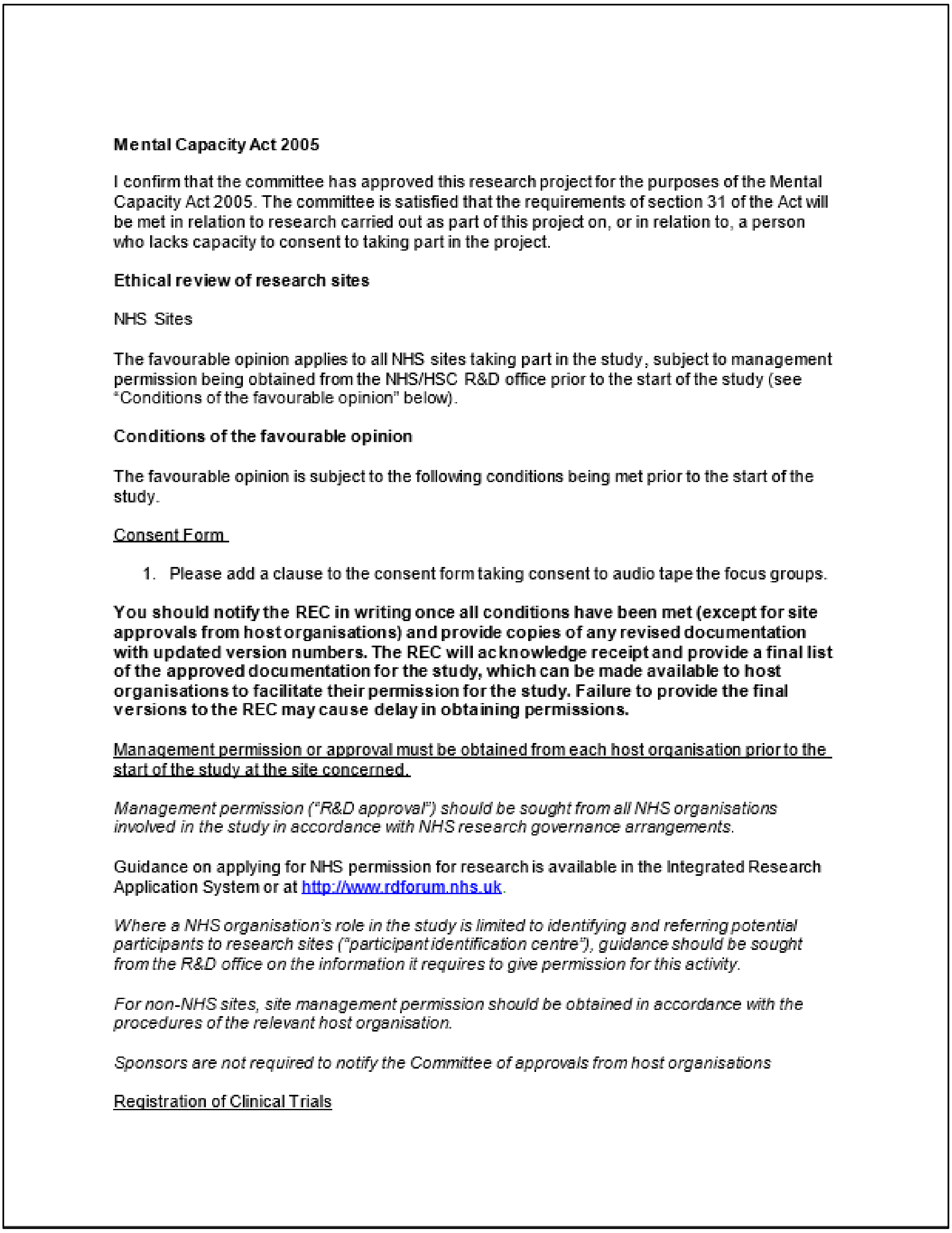
You agreed that the connotations of 'drinking' and alcohol were potentially an issue but felt that, once the study was explained that this would not be an issue.

- The committee questioned whether, in the sister study, the researchers are looking to study awareness of dehydration in carers, or care home residents, or both.

You indicated that you are looking at both. In this study the aim is to develop a quick test for dehydration using skin samples and also takes blood samples to act as a cross reference. The data for that study is being analysed at the moment.

Decision – Favourable opinion (with additional conditions)

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.



Mental Capacity Act 2005

I confirm that the committee has approved this research project for the purposes of the Mental Capacity Act 2005. The committee is satisfied that the requirements of section 31 of the Act will be met in relation to research carried out as part of this project on, or in relation to, a person who lacks capacity to consent to taking part in the project.

Ethical review of research sites

NHS Sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Consent Form

1. Please add a clause to the consent form taking consent to audio tape the focus groups.

You should notify the REC in writing once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which can be made available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database within 6 weeks of recruitment of the first participant (for medical device studies, within the timeline determined by the current registration and publication trees).

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non clinical trials this is not currently mandatory.

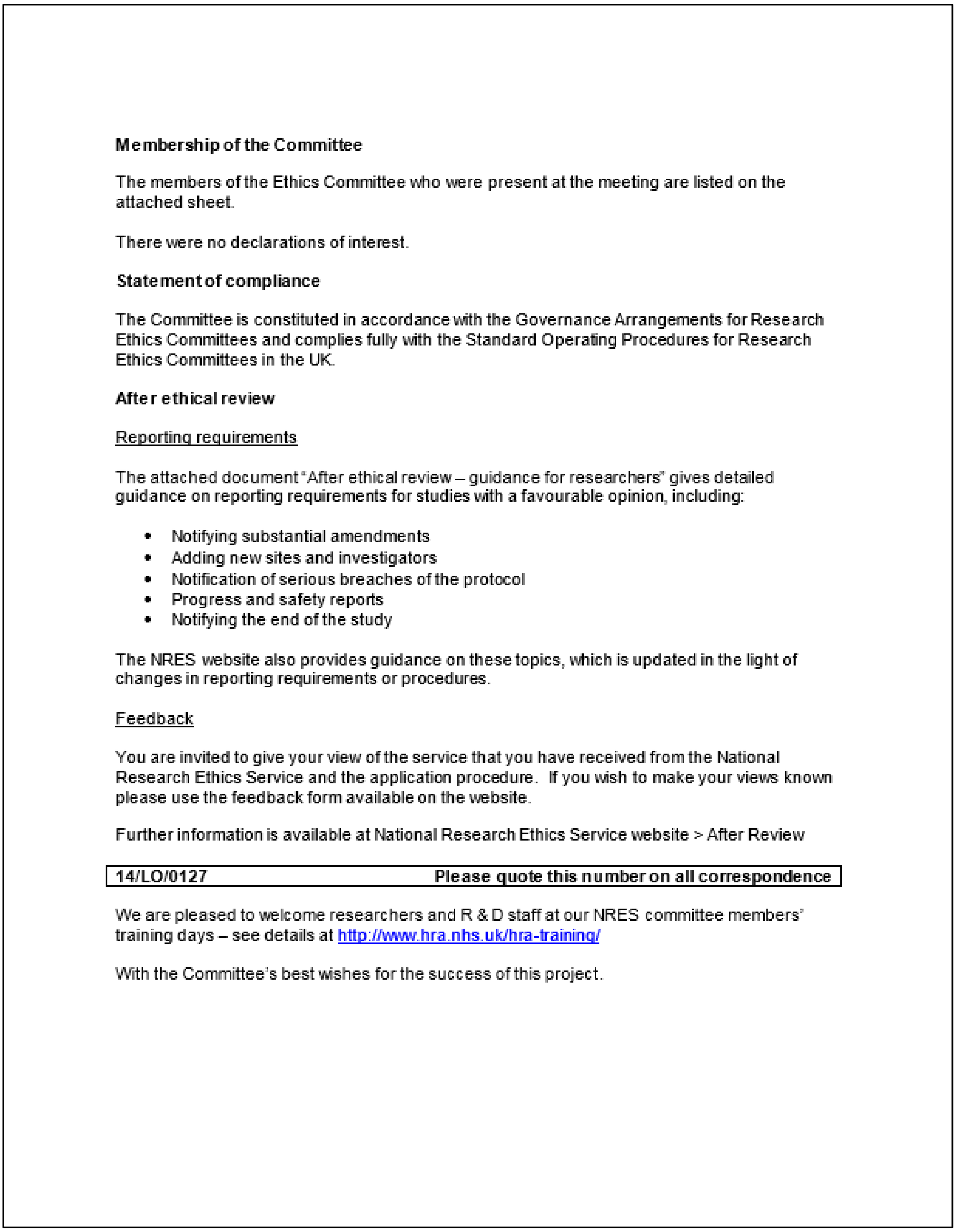
If a sponsor wishes to contest the need for registration they should contact Catherine Blewett (catherineblewett@nhs.net), the HRA does not, however, expect exceptions to be made. Guidance on where to register is provided within IRAS.

It is responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The documents reviewed and approved at the meeting were:

Document	*Version*	*Date*
Advertisement	1	02 December 2013
Covering Letter		20 December 2013
Evidence of insurance or indemnity		17 December 2013
Other: Letter of Invitation - Manager	1	02 December 2013
Other: Letter of Invitation - Consultee	1	02 December 2013
Other: Participant Interview schedule	1	02 December 2013
Other: GP topic guide	1	02 December 2013
Other: Assessment of Capacity	1	02 December 2013
Other: Letter for Managers	1	02 December 2013
Other: CV - LH		17 December 2013
Other: CV - DB		02 December 2013
Other: CV - FP		17 December 2013
Other: Request for SSA exemption		03 January 2014
Participant Consent Form: Gatekeeper Consent	1	02 December 2013
Participant Consent Form: Consultee	1	02 December 2013
Participant Consent Form: Participant	1	02 December 2013
Participant Information Sheet	1	02 December 2013
Participant Information Sheet: PIS Summary	1	02 December 2013
Protocol	1	02 December 2013
REC application		19 December 2013
Summary/Synopsis	1	02 December 2013



Membership of the Committee

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.

There were no declarations of interest.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

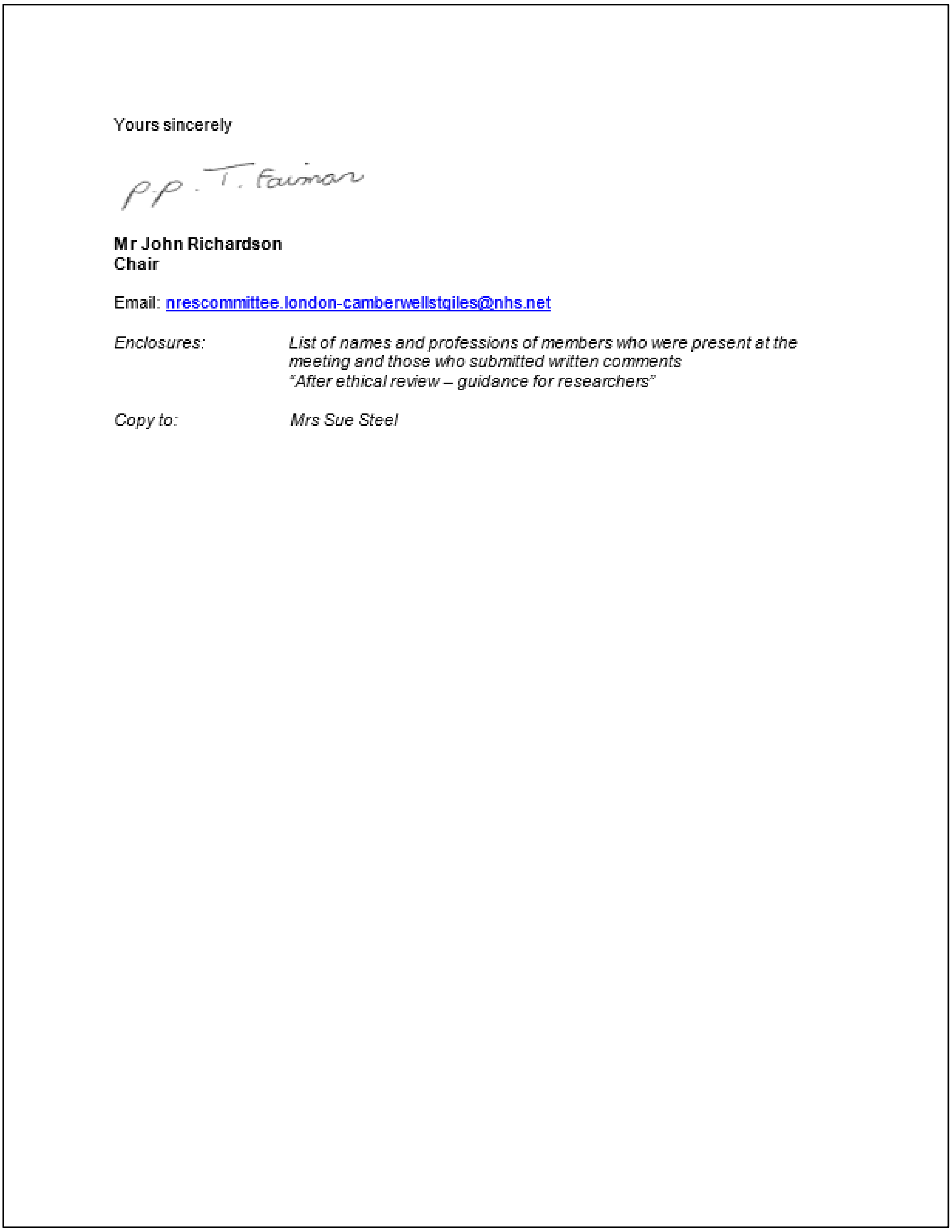
You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

14/LO/0127 **Please quote this number on all correspondence**

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

With the Committee's best wishes for the success of this project.



Yours sincerely

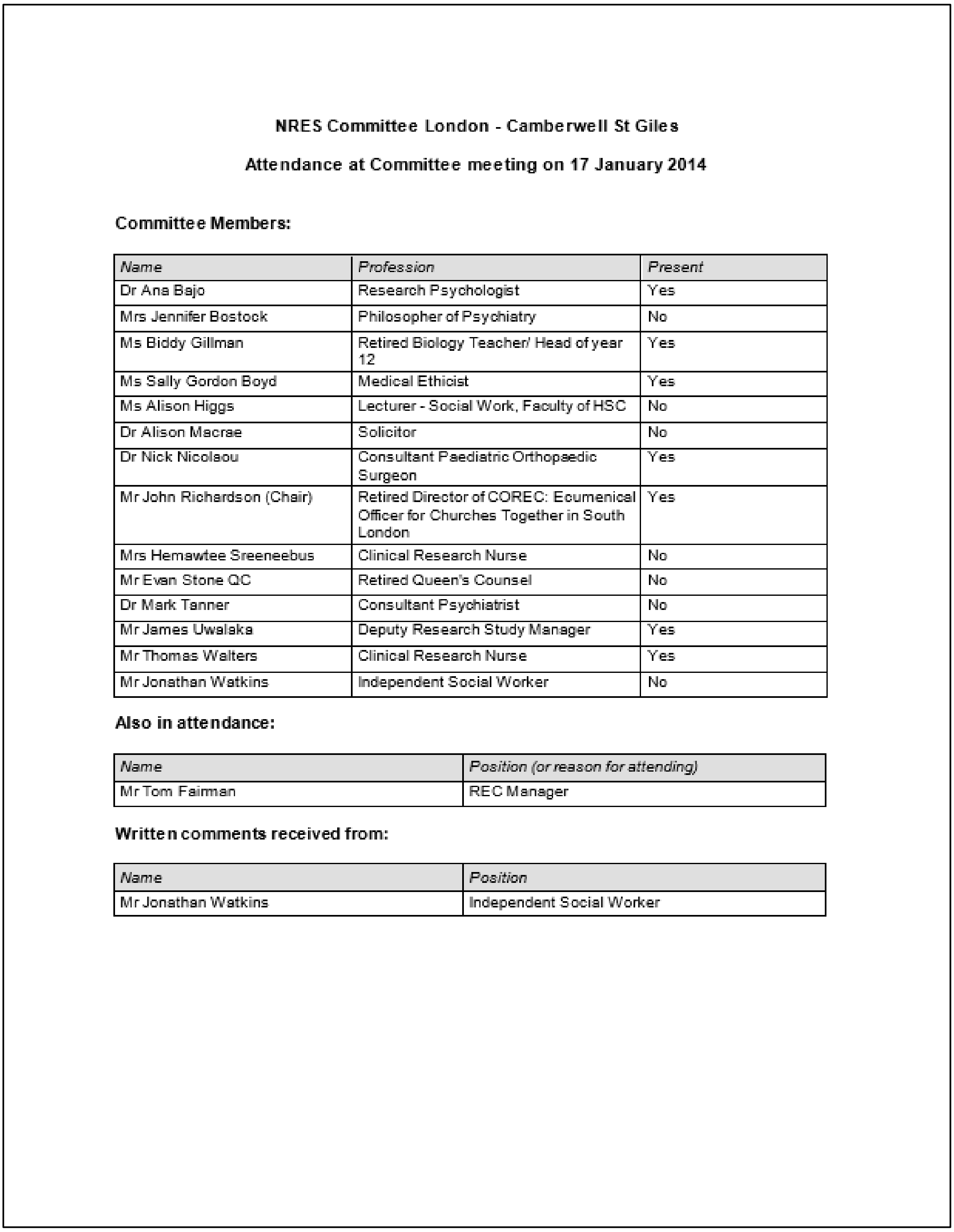
p.p. T. Fairman

Mr John Richardson
Chair

Email: nrescommittee.london-camberwellstgiles@nhs.net

Enclosures: *List of names and professions of members who were present at the meeting and those who submitted written comments*
"After ethical review – guidance for researchers"

Copy to: *Mrs Sue Steel*



NRES Committee London - Camberwell St Giles

Attendance at Committee meeting on 17 January 2014

Committee Members:

Name	*Profession*	*Present*
Dr Ana Bajo	Research Psychologist	Yes
Mrs Jennifer Bostock	Philosopher of Psychiatry	No
Ms Biddy Gillman	Retired Biology Teacher/ Head of year 12	Yes
Ms Sally Gordon Boyd	Medical Ethicist	Yes
Ms Alison Higgs	Lecturer - Social Work, Faculty of HSC	No
Dr Alison Macrae	Solicitor	No
Dr Nick Nicolaou	Consultant Paediatric Orthopaedic Surgeon	Yes
Mr John Richardson (Chair)	Retired Director of COREC: Ecumenical Officer for Churches Together in South London	Yes
Mrs Hemawtee Sreeneebus	Clinical Research Nurse	No
Mr Evan Stone QC	Retired Queen's Counsel	No
Dr Mark Tanner	Consultant Psychiatrist	No
Mr James Uwalaka	Deputy Research Study Manager	Yes
Mr Thomas Walters	Clinical Research Nurse	Yes
Mr Jonathan Watkins	Independent Social Worker	No

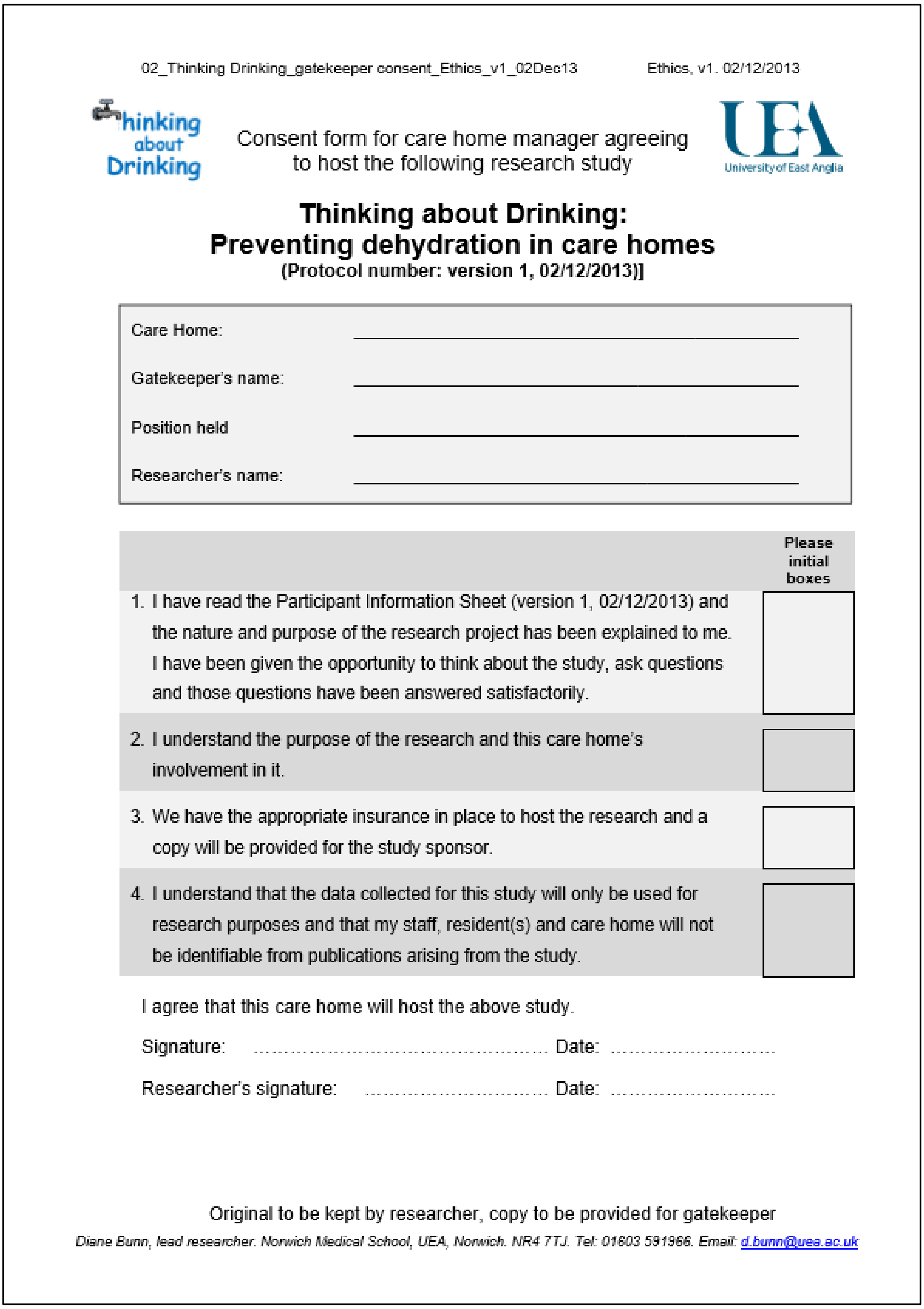
Also in attendance:

Name	*Position (or reason for attending)*
Mr Tom Fairman	REC Manager

Written comments received from:

Name	*Position*
Mr Jonathan Watkins	Independent Social Worker

Appendix 17: Qualitative Study Gatekeeper Consent Form



02_Thinking Drinking_gatekeeper consent_Ethics_v1_02Dec13 Ethics, v1. 02/12/2013

Thinking about Drinking

Consent form for care home manager agreeing
to host the following research study

UEA
University of East Anglia

Thinking about Drinking:
Preventing dehydration in care homes

(Protocol number: version 1, 02/12/2013)]

Care Home: ________________________________

Gatekeeper's name: ________________________________

Position held ________________________________

Researcher's name: ________________________________

	Please initial boxes
1. I have read the Participant Information Sheet (version 1, 02/12/2013) and the nature and purpose of the research project has been explained to me. I have been given the opportunity to think about the study, ask questions and those questions have been answered satisfactorily.	☐
2. I understand the purpose of the research and this care home's involvement in it.	☐
3. We have the appropriate insurance in place to host the research and a copy will be provided for the study sponsor.	☐
4. I understand that the data collected for this study will only be used for research purposes and that my staff, resident(s) and care home will not be identifiable from publications arising from the study.	☐

I agree that this care home will host the above study.

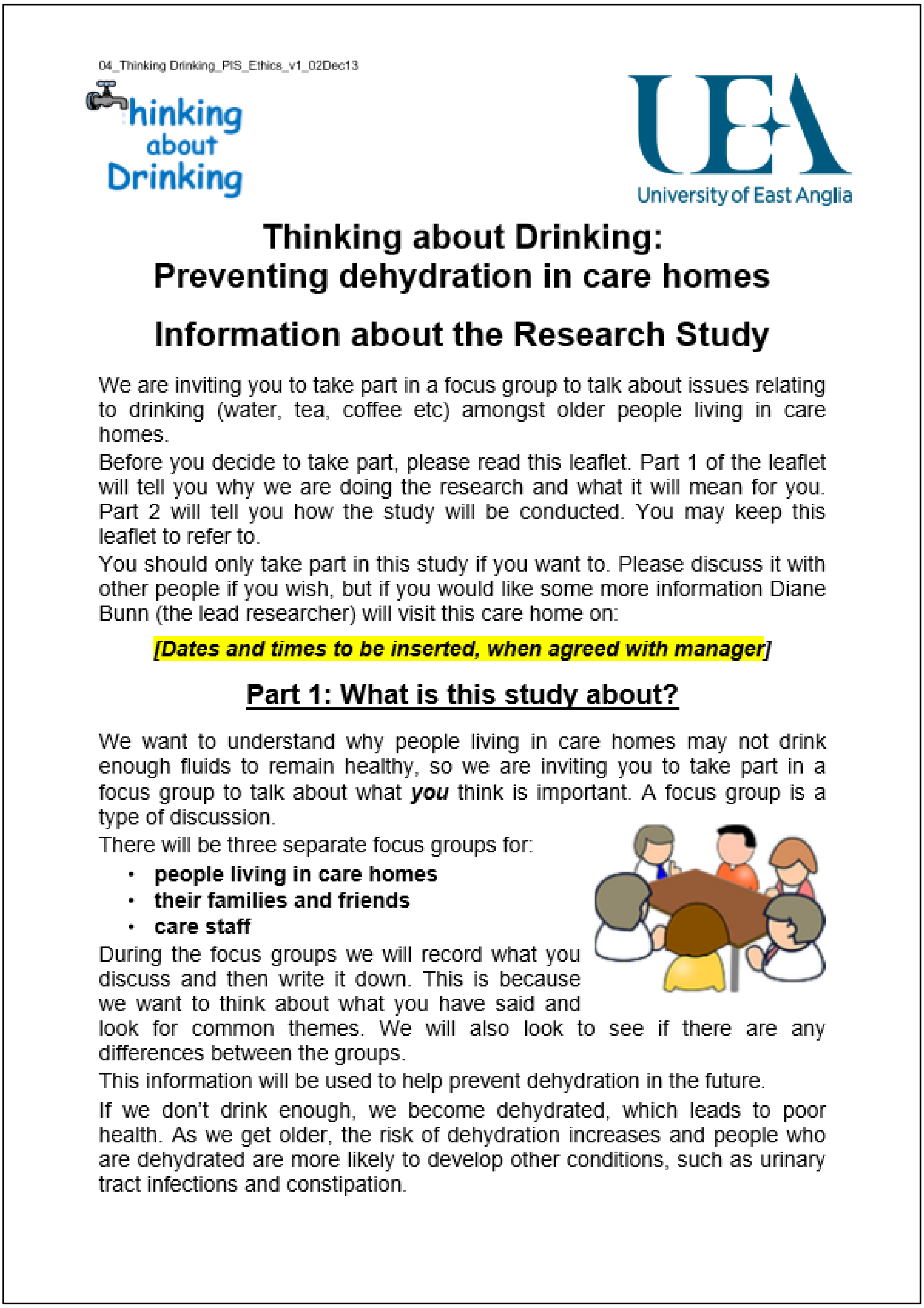
Signature: ………………………………………… Date: ………………………

Researcher's signature: ………………………… Date: ………………………

Original to be kept by researcher, copy to be provided for gatekeeper

Diane Bunn, lead researcher. Norwich Medical School, UEA, Norwich. NR4 7TJ. Tel: 01603 591966. Email: d.bunn@uea.ac.uk

Appendix 18: Qualitative Study Participant Information Sheet



04_Thinking Drinking_PIS_Ethics_v1_02Dec13

Thinking about Drinking:
Preventing dehydration in care homes

Information about the Research Study

We are inviting you to take part in a focus group to talk about issues relating to drinking (water, tea, coffee etc) amongst older people living in care homes.

Before you decide to take part, please read this leaflet. Part 1 of the leaflet will tell you why we are doing the research and what it will mean for you. Part 2 will tell you how the study will be conducted. You may keep this leaflet to refer to.

You should only take part in this study if you want to. Please discuss it with other people if you wish, but if you would like some more information Diane Bunn (the lead researcher) will visit this care home on:

[Dates and times to be inserted, when agreed with manager]

Part 1: What is this study about?

We want to understand why people living in care homes may not drink enough fluids to remain healthy, so we are inviting you to take part in a focus group to talk about what ***you*** think is important. A focus group is a type of discussion.

There will be three separate focus groups for:

- **people living in care homes**
- **their families and friends**
- **care staff**

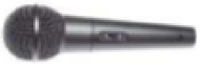
During the focus groups we will record what you discuss and then write it down. This is because we want to think about what you have said and look for common themes. We will also look to see if there are any differences between the groups.

This information will be used to help prevent dehydration in the future.

If we don't drink enough, we become dehydrated, which leads to poor health. As we get older, the risk of dehydration increases and people who are dehydrated are more likely to develop other conditions, such as urinary tract infections and constipation.

What is a focus group?

A focus group is a type of meeting, where people are invited to talk about a topic which the researcher is interested in. In this study, each of the three groups (residents, families and care staff) will be asked to talk about what helps people living in care homes to drink well, and what may make this difficult. Each group will have 4 – 8 participants and two researchers.



All focus groups will take place in care homes (usually your own) and will last about 1 hour.

As part of the research, we will record the meeting so that we can listen to it later and then write it all down (transcribe it) so that we have a written record of everything that has been said. We will anonymise the recordings, giving false names to everyone, so that they cannot be identified.

What will be discussed?

We will ask each group to talk about factors that help or hinder people who live in care homes to drink well. Some people associate drinking with previous experiences, and that would be good to hear as well.

We hope that people will suggest other issues within the groups, and as we are interested in any ideas or views about why people may or may not drink as much as they need, we look forward to hearing about these.

Why have I been invited?

You have been invited to take part, because we think you may meet the following criteria:

1. You live in a care home, are aged at least 65 years and you may or may not need help in the following areas:
   (i) obtaining drinks
   (ii) reminders to drink
   (iii) visiting the toilet

or

2. You are a family member or friend of someone living in a care home and you visit them at least twice a month.

or

You are a staff member who works in the care home with day-to-day responsibilities for providing personal care or managerial support. We would like to include both men and women and some staff where English is not their first language.

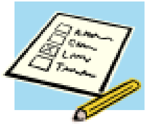
Do I have to take part?

No. It is entirely up to you to decide whether to take part or not. If you decide to take part, you are free to withdraw at any time and without giving a reason. A decision to withdraw, or a decision not to take part, will not affect you in any way.

However, it will not be possible to withdraw your information after the focus group, as it will be intertwined with that from other participants.

If you would like to take part, we will talk to you about the study and we will ask you, or a relative, to sign a consent form.

Is any other information required?

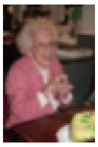


Before the study begins we will ask you some background details about yourself. This will include your date of birth, whether you are male or female, how long you have been associated with the care home and your present role.

How much time will I spend on the study?

The focus groups are the main part of the study and these will take approximately one hour. During the month before the focus groups Diane Bunn will be available to talk about the study and take consent. There will be one meeting following the focus groups where Diane will feed back a summary of the discussions (anonymously, so that no participant names are given).

Who will benefit if I take part in this study?



The aim of the study is to understand why some people living in care homes may not drink enough to remain healthy. By talking to people in the focus groups we will learn about what these issues are, and this information will be used to develop ideas to prevent dehydration to help people in the future.

By taking part in the focus groups you will be contributing to other people's well-being and we hope that you enjoy the experience. Everyone taking part in a focus group will be offered a £10 voucher (or a beauty product of equivalent value) as a 'Thank you' for their time and participation.

Are there any possible risks to me if I take part?

You are not likely to come to any harm by taking part in this study. The researchers will ask the focus groups to discuss issues around drinking. We would like to know what helps you to drink, and what things make drinking more difficult. Some topics may be embarrassing or upsetting. It is up to you to choose what experiences you feel comfortable about sharing within the group.

We ask everyone who takes part in the focus groups NOT to discuss what was said outside the group. It is possible that this confidentiality may not be maintained, and this may be upsetting for some of the participants if this happens.

If anything about the study upsets you or raises questions for you during the study, please contact the lead researcher, Diane Bunn.

Part 2: Conduct of the study

If the information in part 1 has interested you and you think you might like to take part, please read the additional information below.

Confidentiality: will the information be kept confidential?

We will ask everyone taking part in the focus groups to keep confidential any information or views about other participants in the group and others not present.

The researchers will maintain confidentiality and ensure that information gathered during the study is stored in accordance with the 1998 Data Protection Act. Electronic data, including audio recordings, will be stored on secure servers and will be password-protected. Paper information will be stored in locked filing cabinets in locked offices. Information will be kept for two years after the study finishes. The information will only be accessible to authorised persons (researchers, sponsor and regulatory authorities who monitor the quality of the research). Diane Bunn (lead researcher), will be the custodian. We will publish the results of this study so that others can learn from our findings, but you will not be identified in any publications. We will also send you a copy of the results.

Who will know that I am taking part in the study?

The researchers will know and we will ask your permission to inform the care home manager where you live, work or visit. You may say 'no' to this. Discussions occurring during the focus group will remain confidential unless doing so would put anyone at risk of serious harm. In this case the researcher will discuss with you the appropriate action and if anyone should be informed.

I would like to take part, so what happen next?

If you would like to take part, please let Diane Bunn know when she visits for the information day (see front page for dates and times), or you can contact her at:

Diane Bunn, Norwich Medical School, UEA, Norwich. NR4 7TJ.

Telephone: 01603 591966, email: d.bunn@uea.ac.uk.

You will be asked to sign a consent form and answer some questions about yourself.

Diane will let you know the date and time of the focus group, but all focus groups will take place between April 2014 and February 2015.

Who is organising and funding the focus groups?

This study forms part of Diane Bunn's PhD which is funded by the National Institute of Health Research (NIHR, reference: NIHR-CDF-2011-04-025) as part of a Career Development Fellowship to Dr Lee Hooper (Senior Lecturer in Research Synthesis and Nutrition), Norwich Medical School, UEA, Norwich. NR4 7TJ. **l.hooper@uea.ac.uk**, 01603 591268. Diane's supervisors for this study are Professor Fiona Poland (Professor of Social Research Methodology) & Dr Lee Hooper.

The study's sponsor is Sue Steel, (Contracts Manager), Research and Enterprise Hub, UEA, Norwich. NR4 7TJ. **sue.steel@uea.ac.uk**, 01603 591486.

Who has reviewed the study?

This research has been reviewed by an independent group of people, called a Research Ethics Committee, to protect your interests. This study received a favourable opinion by NRES Committee London - Camberwell St Giles on 31/01/2014. Ref: 14 LO 0127 re Protocol, v1, 02/12/2013.

If you have a concern about any aspect of this study, please speak to the researchers in the first instance. If you remain unhappy and wish to complain formally, contact the study sponsor, Sue Steel.

Appendix 19: Qualitative Study Participant Information Sheet (summary)

05_Thinking Drinking_PIS Summary_Ethics_v1_02Dec13 Ethics, v1. 02/12/2013

Thinking about Drinking

University of East Anglia

Thinking about Drinking:
Preventing dehydration in care homes

Summary of Information about the Research Study

Would you like to take part in a study?

I would like you to help me, but only if you want to.

I will come and talk to you about the study on:

[Dates and times inserted, when agreed with manager]

What is the study about?

We want to find out about what things help us to drink and what things make it hard for us to drink.

We are doing this because we want to help people feel better.

Would you like to talk about this with other people in a group?

Page 1 of 4

What will happen?

We will meet here, in one of the sitting rooms.

It will take about an hour

We will record the conversation and write it down,

and we will ask you some details about yourself.

There will be another, shorter meeting, about a month later.

We will keep the information securely and only the researchers and official inspectors will be able to look at this.

Will this study help me?

You may enjoy the discussion.

Everyone taking part will receive a small gift or a voucher.

Will this study hurt me?

No, but sometimes a memory may be upsetting.
If this happens, one of the researchers will help you.

If you change your mind,
we will stop and you can leave.

Will anyone know that I am taking part?

Other people living and working here may know if they join in with the discussions.

Your relatives may know if we need to ask them about you taking part.

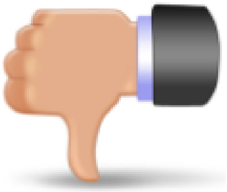
The manager here may know also know.

What will happen to all the information?

We will publish the results of this study so that others can learn about we find, and we will send you a copy as well.

Would you like to take part in this study?

YES
Please



NO
Thank you

I would like to take part, what happens next?

Please tell Diane Bunn know when she visits for the information day (see front page for dates and times), or you can contact her at:

Diane Bunn, Norwich Medical School, UEA, Norwich. NR4 7TJ.

Telephone: 01603 591966, email: d.bunn@uea.ac.uk

Diane will ask you, or a relative to sign a consent form.

Diane will let you know the date and time of the focus group, but all focus groups will take place between April 2014 and February 2015.

Who is organising and funding this study?

Diane Bunn is the lead researcher for this study which forms part of her PhD. This study is funded by the National Institute of Health Research (NIHR, reference: NIHR-CDF-2011-04-025) as part of a Career Development Fellowship to Dr Lee Hooper (Senior Lecturer in Research Synthesis and Nutrition), Norwich Medical School, UEA, Norwich. NR4 7TJ. l.hooper@uea.ac.uk, 01603 591268. Diane's supervisors for this study are Professor Fiona Poland (Professor of Social Research Methodology) & Dr Lee Hooper.

The study's sponsor is Sue Steel, (Contracts Manager), Research and Enterprise Hub, UEA, Norwich. NR4 7TJ. sue.steel@uea.ac.uk, 01603 591486.

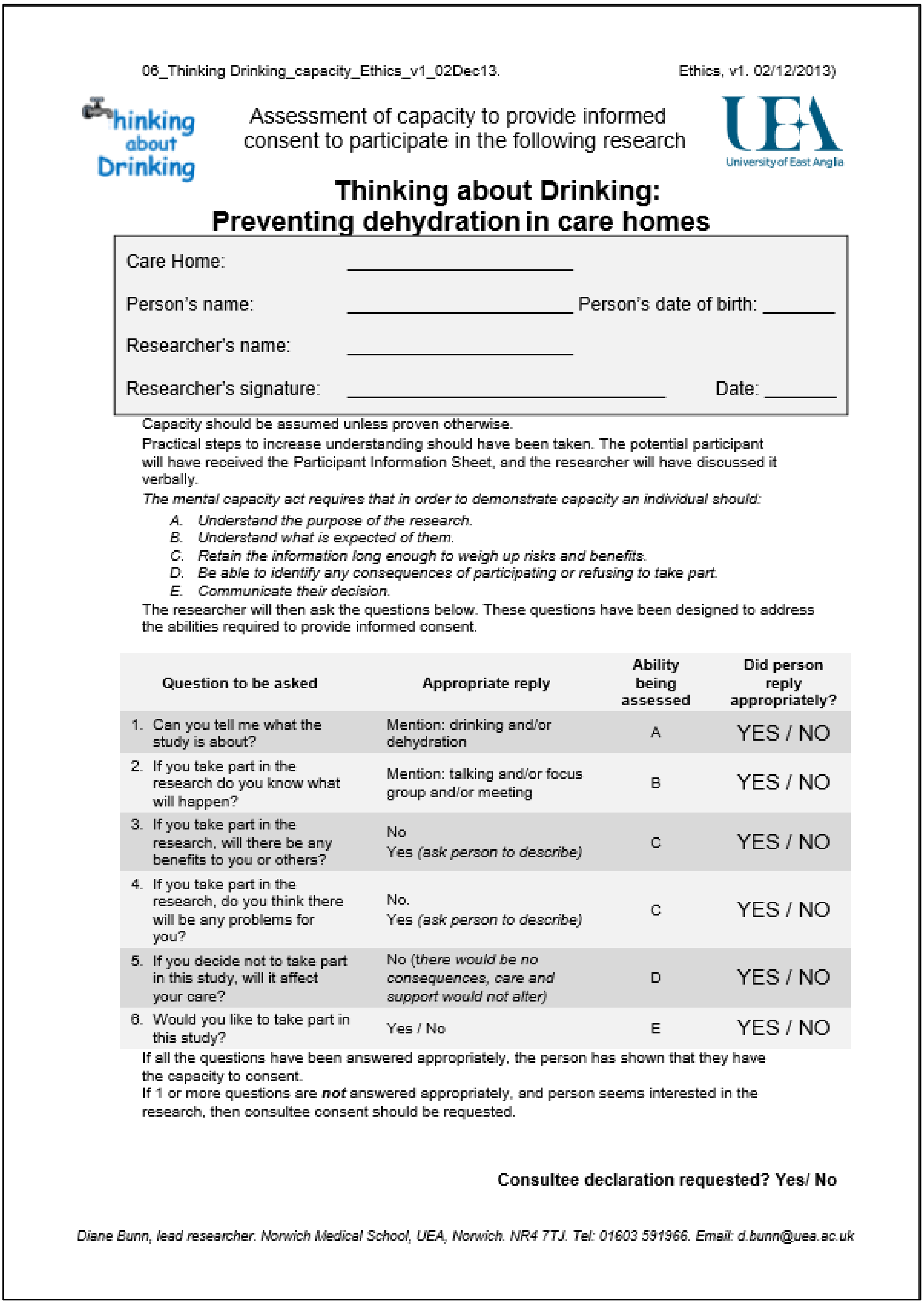
Who has reviewed this study?

This research has been reviewed by an independent group of people, called a Research Ethics Committee, to protect your interests. This study received a favourable opinion by NRES Committee London–Camberwell St Giles on 31/01/2014. Ref: 14 LO 0127; Protocol reference: version 1, 02/12/2013.

If you have a concern about any aspect of this study, please speak to the researchers in the first instance. If you remain unhappy and wish to complain formally, contact the study sponsor, Sue Steel.

PLEASE KEEP THIS INFORMATION LEAFLET

Appendix 20: Qualitative Study Capacity Assessment Form



06_Thinking Drinking_capacity_Ethics_v1_02Dec13. Ethics, v1. 02/12/2013)

Thinking about Drinking

Assessment of capacity to provide informed consent to participate in the following research

UEA University of East Anglia

Thinking about Drinking: Preventing dehydration in care homes

Care Home: ____________________

Person's name: ____________________ Person's date of birth: _______

Researcher's name: ____________________

Researcher's signature: ____________________________ Date: _______

Capacity should be assumed unless proven otherwise.

Practical steps to increase understanding should have been taken. The potential participant will have received the Participant Information Sheet, and the researcher will have discussed it verbally.

The mental capacity act requires that in order to demonstrate capacity an individual should:

- *A. Understand the purpose of the research.*
- *B. Understand what is expected of them.*
- *C. Retain the information long enough to weigh up risks and benefits.*
- *D. Be able to identify any consequences of participating or refusing to take part.*
- *E. Communicate their decision.*

The researcher will then ask the questions below. These questions have been designed to address the abilities required to provide informed consent.

Question to be asked	Appropriate reply	Ability being assessed	Did person reply appropriately?
1. Can you tell me what the study is about?	Mention: drinking and/or dehydration	A	YES / NO
2. If you take part in the research do you know what will happen?	Mention: talking and/or focus group and/or meeting	B	YES / NO
3. If you take part in the research, will there be any benefits to you or others?	No Yes *(ask person to describe)*	C	YES / NO
4. If you take part in the research, do you think there will be any problems for you?	No. Yes *(ask person to describe)*	C	YES / NO
5. If you decide not to take part in this study, will it affect your care?	No *(there would be no consequences, care and support would not alter)*	D	YES / NO
6. Would you like to take part in this study?	Yes / No	E	YES / NO

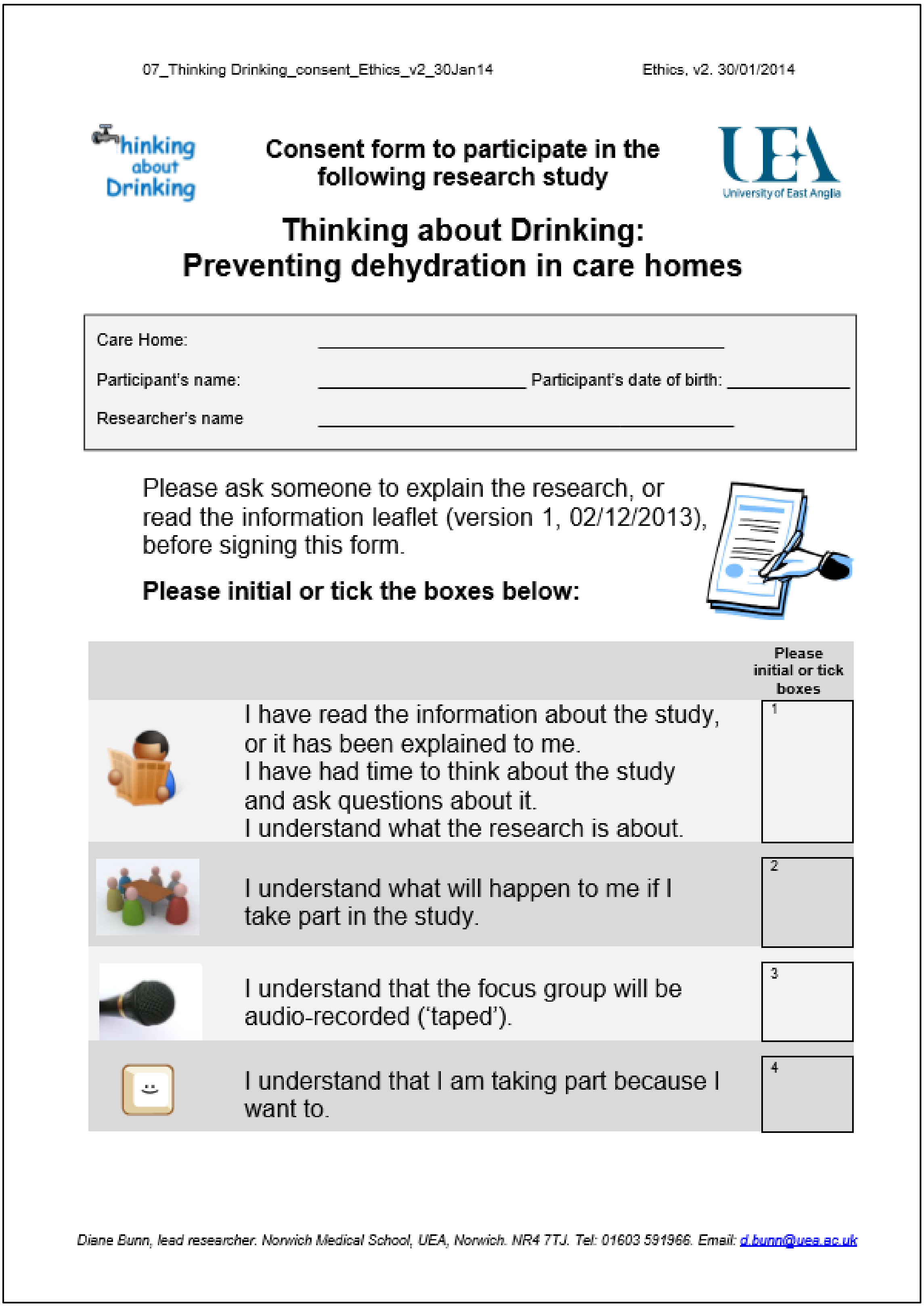
If all the questions have been answered appropriately, the person has shown that they have the capacity to consent.

If 1 or more questions are ***not*** answered appropriately, and person seems interested in the research, then consultee consent should be requested.

Consultee declaration requested? Yes/ No

Diane Bunn, lead researcher. Norwich Medical School, UEA, Norwich. NR4 7TJ. Tel: 01603 591966. Email: d.bunn@uea.ac.uk

Appendix 21: Qualitative Study Participant Consent Form



07_Thinking Drinking_consent_Ethics_v2_30Jan14 Ethics, v2. 30/01/2014

Consent form to participate in the following research study

Thinking about Drinking:
Preventing dehydration in care homes

Care Home: ______________________________

Participant's name: ____________________ Participant's date of birth: ____________

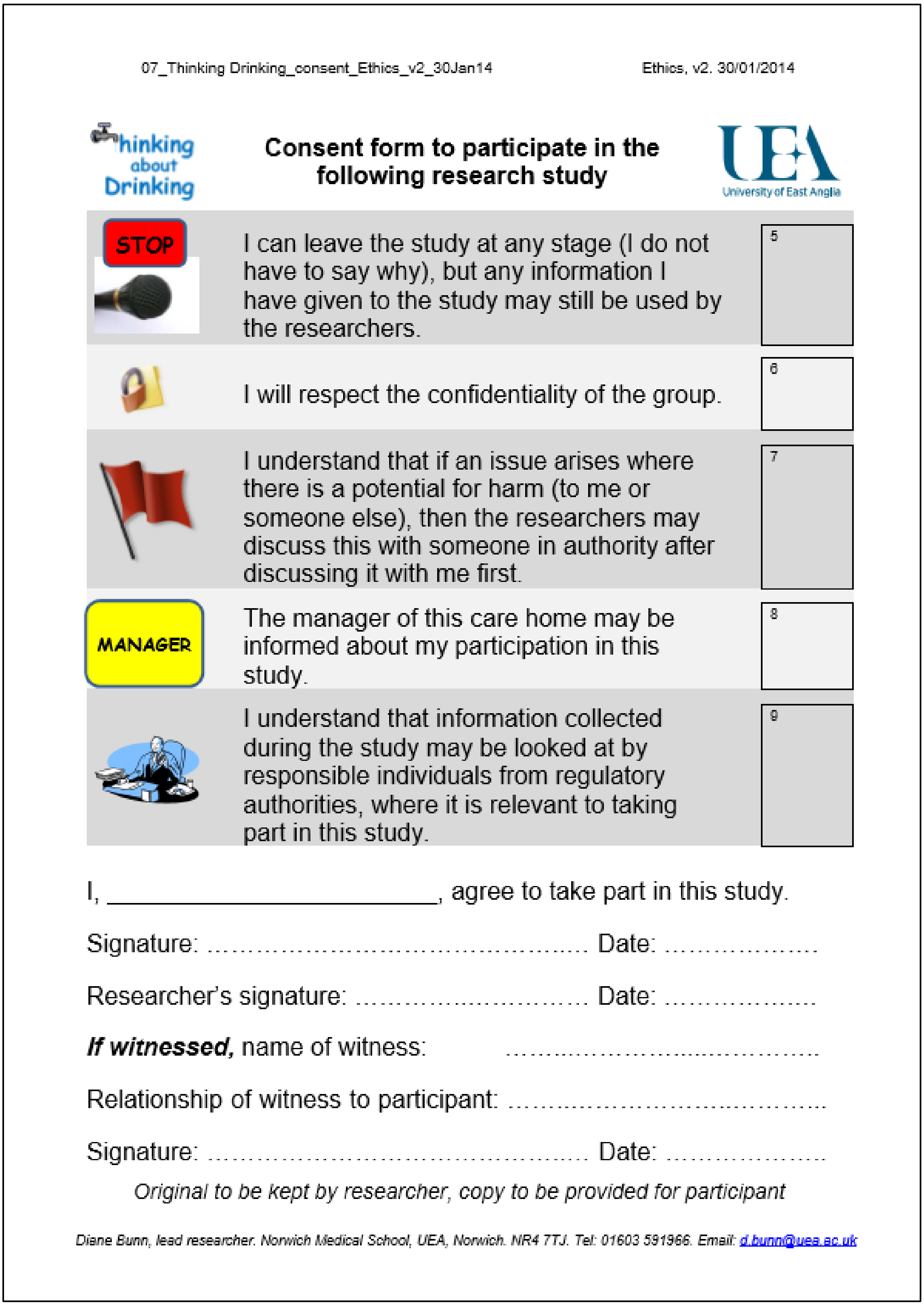
Researcher's name ______________________________

Please ask someone to explain the research, or read the information leaflet (version 1, 02/12/2013), before signing this form.

Please initial or tick the boxes below:

	Please initial or tick boxes
I have read the information about the study, or it has been explained to me. I have had time to think about the study and ask questions about it. I understand what the research is about.	1
I understand what will happen to me if I take part in the study.	2
I understand that the focus group will be audio-recorded ('taped').	3
I understand that I am taking part because I want to.	4

Diane Bunn, lead researcher. Norwich Medical School, UEA, Norwich. NR4 7TJ. Tel: 01603 591966. Email: d.bunn@uea.ac.uk



07_Thinking Drinking_consent_Ethics_v2_30Jan14 Ethics, v2. 30/01/2014

Consent form to participate in the following research study

STOP	I can leave the study at any stage (I do not have to say why), but any information I have given to the study may still be used by the researchers.	5 ☐
	I will respect the confidentiality of the group.	6 ☐
	I understand that if an issue arises where there is a potential for harm (to me or someone else), then the researchers may discuss this with someone in authority after discussing it with me first.	7 ☐
MANAGER	The manager of this care home may be informed about my participation in this study.	8 ☐
	I understand that information collected during the study may be looked at by responsible individuals from regulatory authorities, where it is relevant to taking part in this study.	9 ☐

I, ____________________________, agree to take part in this study.

Signature: .... Date: ....

Researcher's signature: .... Date: ....

If witnessed, name of witness: ....

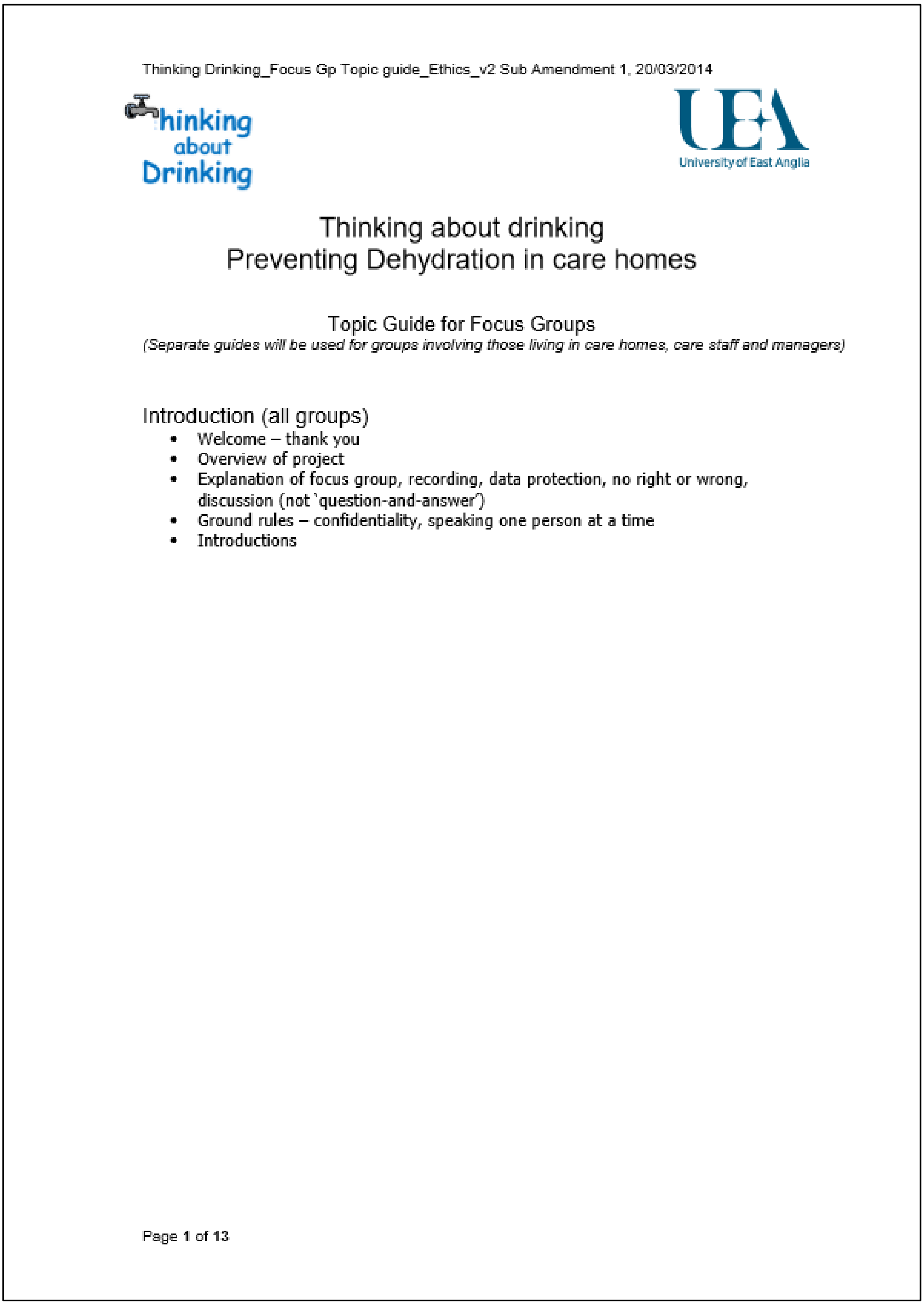
Relationship of witness to participant: ....

Signature: .... Date: ....

Original to be kept by researcher, copy to be provided for participant

Diane Bunn, lead researcher. Norwich Medical School, UEA, Norwich. NR4 7TJ. Tel: 01603 591966. Email: d.bunn@uea.ac.uk

Appendix 22: Qualitative Study Topic guide



Thinking about drinking
Preventing Dehydration in care homes

Topic Guide for Focus Groups

(Separate guides will be used for groups involving those living in care homes, care staff and managers)

Introduction (all groups)

- Welcome – thank you
- Overview of project
- Explanation of focus group, recording, data protection, no right or wrong, discussion (not 'question-and-answer')
- Ground rules – confidentiality, speaking one person at a time
- Introductions

Indicative topic guide for groups involving people living in care homes

These are the suggested discussion topics, but within the focus groups participants may choose to move away from these and discuss other issues.

1. Opening Questions

- Can you tell me your name (or the name you would like to be called by for today) and what your favourite drink is?

2. Introductory Questions

Play: A nice cup of tea in the morning (1st chorus only, Appendix 1), Binnie Hale. (http://www.youtube.com/watch?v=SE5lflkl_oA)

- When do you like to drink a cup of tea?

  Probe: How do you like to drink your tea?

  Probe: What other drinks do you like?

3. Transition Questions

Distribute photographs of different settings for drinking tea/coffee (Appendix 2):

Photo 1: 'Traditional tea-time', lacy cloth, china cups, cakes

Photo 2: Institutional drinks

Photo 3: People socialising

Photo 4: Single person drinking a cup of tea / coffee

- Where do you like to take your drinks?

  Probe: Why is that?

  Probe: What type of places?

  Probe: Times of day, special times?

- What type of cup or glass do you like to drink from?

  (referring to the variety of cups & glasses on the table, chosen because they are different sizes, are different colours and have different shapes)

  Probe: Which cups on the table do you particularly like? Why is that? What do you like about it (them)?

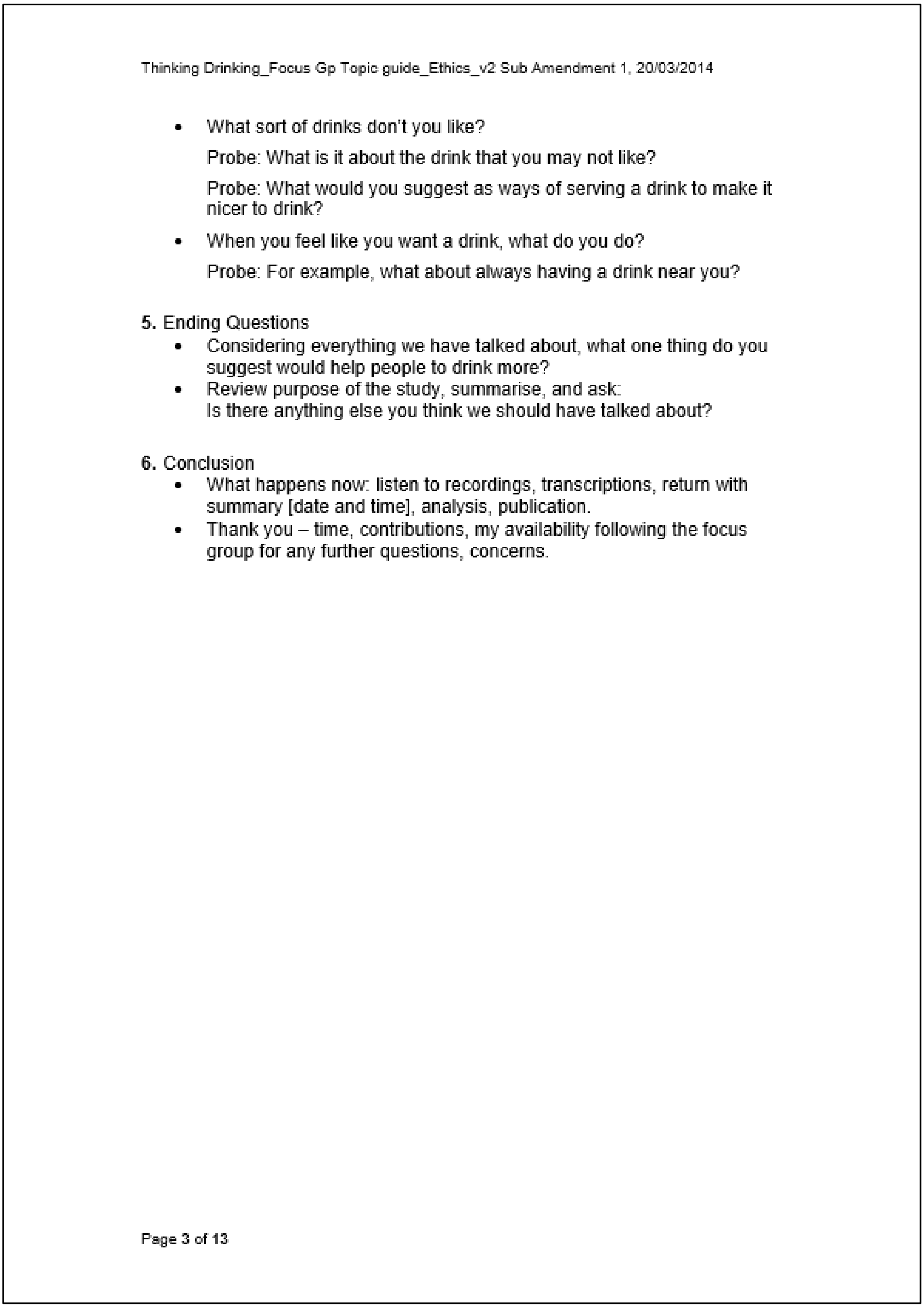
  Probe: Do you like different cups for different drinks? Why is that?

4. Key Questions

- Are there times when you just don't want to drink?

  Probe: What sort of things put you off drinking? Why is that?

  Probe: Are there any occasions when you have been offered a drink, but you didn't want it? Why was that?



- What sort of drinks don't you like?

  Probe: What is it about the drink that you may not like?

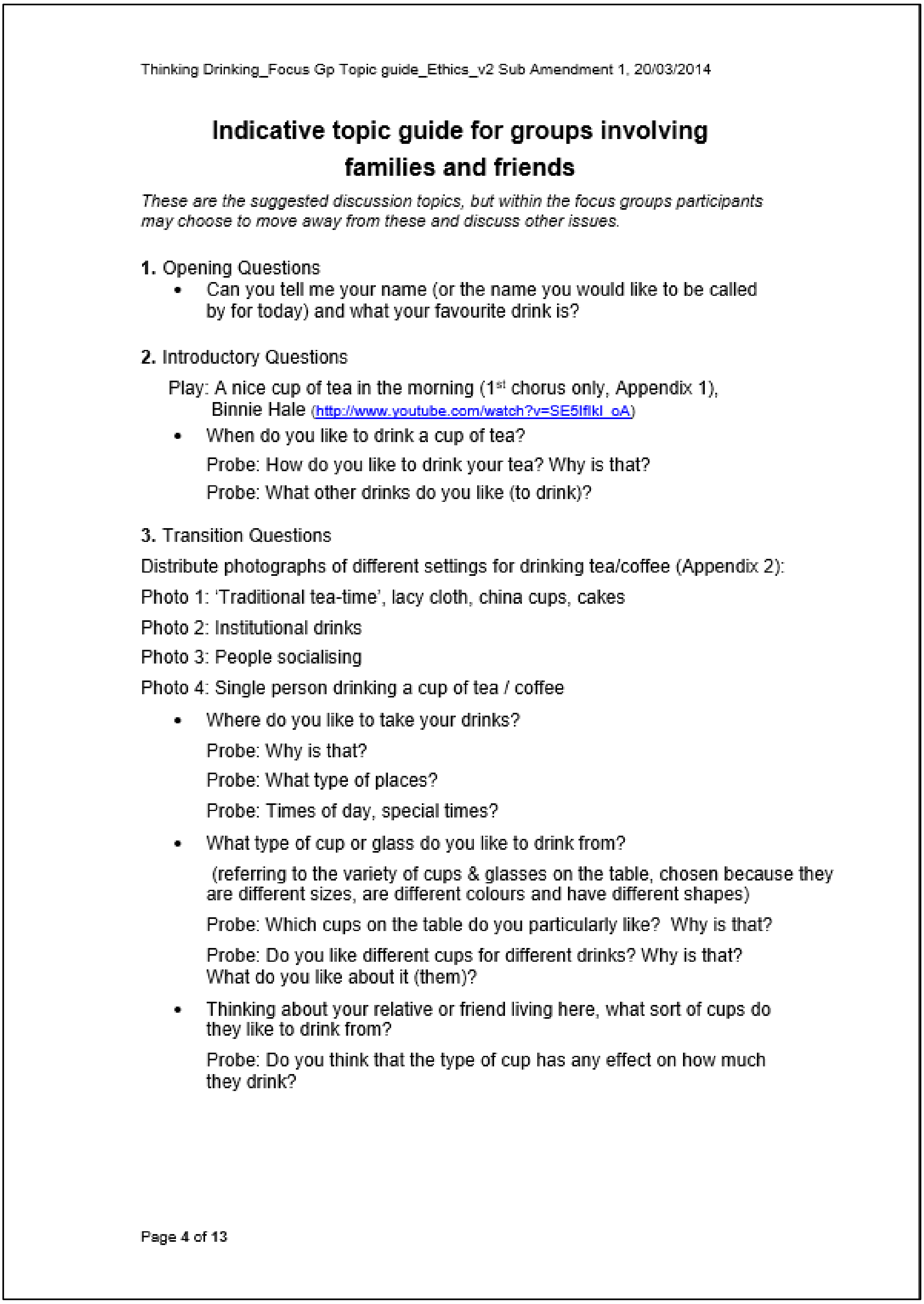
  Probe: What would you suggest as ways of serving a drink to make it nicer to drink?

- When you feel like you want a drink, what do you do?

  Probe: For example, what about always having a drink near you?

5. Ending Questions
- Considering everything we have talked about, what one thing do you suggest would help people to drink more?
- Review purpose of the study, summarise, and ask:
  Is there anything else you think we should have talked about?

6. Conclusion
- What happens now: listen to recordings, transcriptions, return with summary [date and time], analysis, publication.
- Thank you – time, contributions, my availability following the focus group for any further questions, concerns.



Thinking Drinking_Focus Gp Topic guide_Ethics_v2 Sub Amendment 1, 20/03/2014

Indicative topic guide for groups involving families and friends

These are the suggested discussion topics, but within the focus groups participants may choose to move away from these and discuss other issues.

1. Opening Questions

- Can you tell me your name (or the name you would like to be called by for today) and what your favourite drink is?

2. Introductory Questions

Play: A nice cup of tea in the morning (1st chorus only, Appendix 1),
Binnie Hale (http://www.youtube.com/watch?v=SE5lflkl_oA)

- When do you like to drink a cup of tea?

  Probe: How do you like to drink your tea? Why is that?

  Probe: What other drinks do you like (to drink)?

3. Transition Questions

Distribute photographs of different settings for drinking tea/coffee (Appendix 2):

Photo 1: 'Traditional tea-time', lacy cloth, china cups, cakes

Photo 2: Institutional drinks

Photo 3: People socialising

Photo 4: Single person drinking a cup of tea / coffee

- Where do you like to take your drinks?

  Probe: Why is that?

  Probe: What type of places?

  Probe: Times of day, special times?

- What type of cup or glass do you like to drink from?

  (referring to the variety of cups & glasses on the table, chosen because they are different sizes, are different colours and have different shapes)

  Probe: Which cups on the table do you particularly like? Why is that?

  Probe: Do you like different cups for different drinks? Why is that? What do you like about it (them)?

- Thinking about your relative or friend living here, what sort of cups do they like to drink from?

  Probe: Do you think that the type of cup has any effect on how much they drink?

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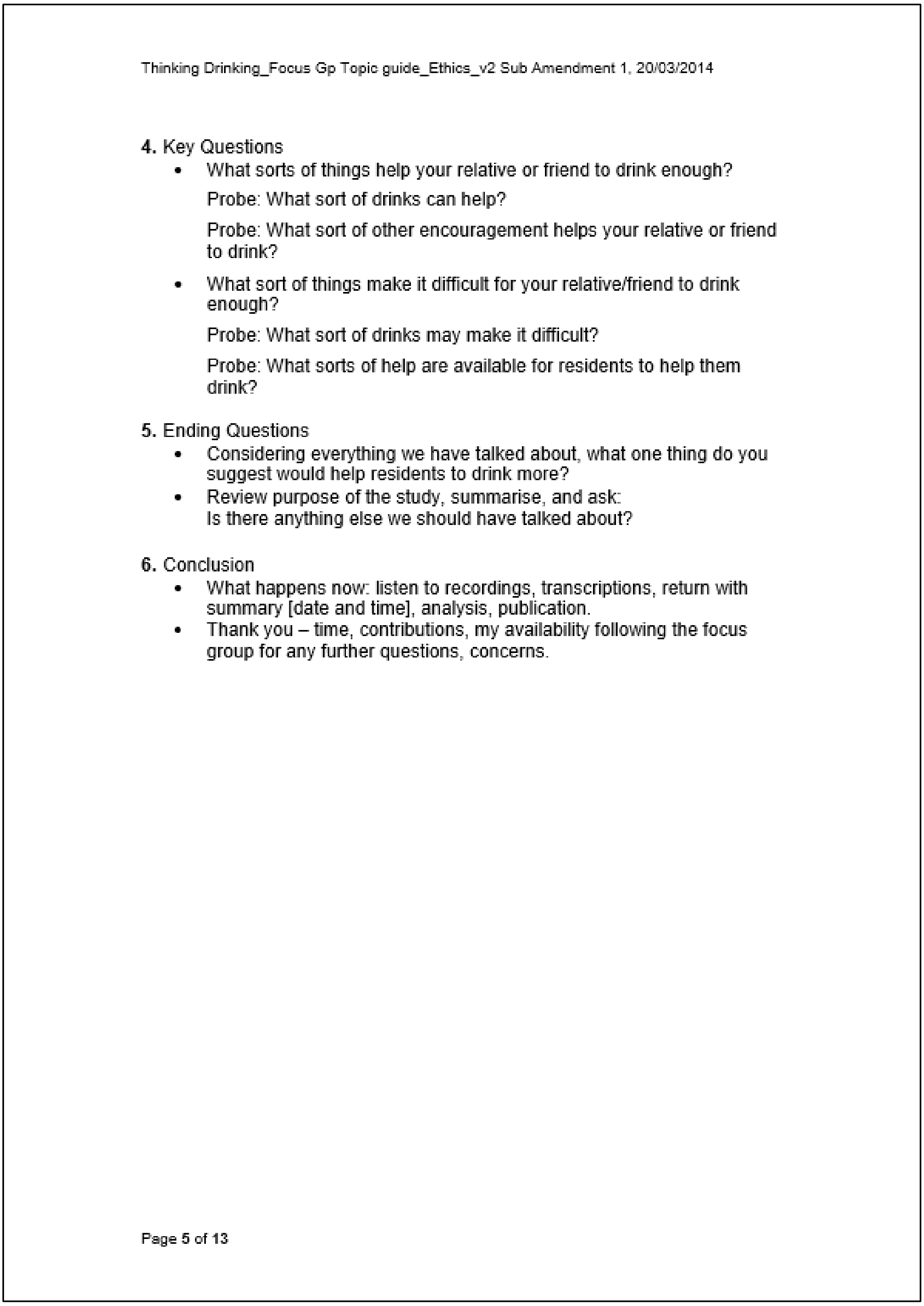


4. Key Questions

- What sorts of things help your relative or friend to drink enough?

  Probe: What sort of drinks can help?

  Probe: What sort of other encouragement helps your relative or friend to drink?

- What sort of things make it difficult for your relative/friend to drink enough?

  Probe: What sort of drinks may make it difficult?

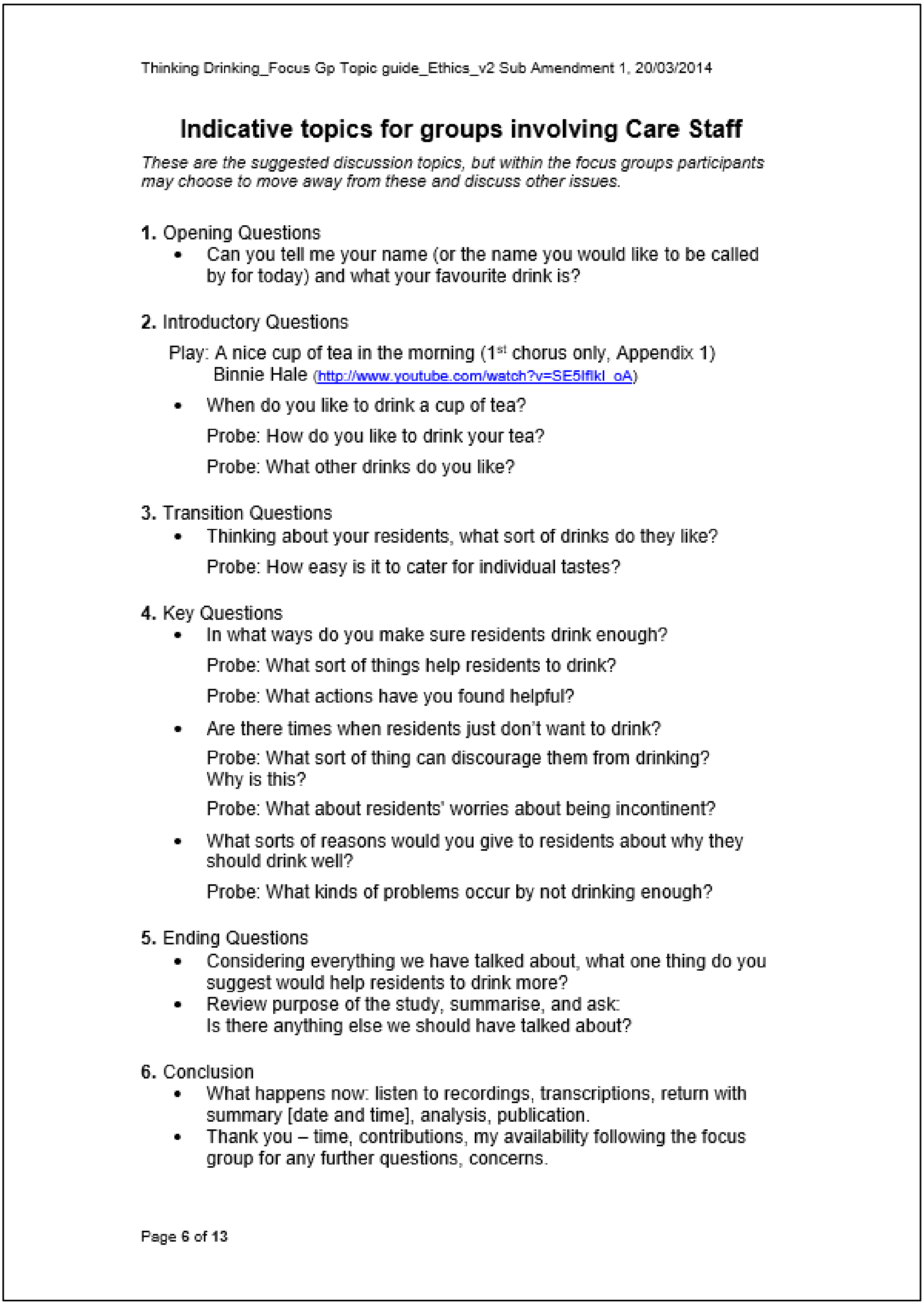
  Probe: What sorts of help are available for residents to help them drink?

5. Ending Questions

- Considering everything we have talked about, what one thing do you suggest would help residents to drink more?
- Review purpose of the study, summarise, and ask:
  Is there anything else we should have talked about?

6. Conclusion

- What happens now: listen to recordings, transcriptions, return with summary [date and time], analysis, publication.
- Thank you – time, contributions, my availability following the focus group for any further questions, concerns.



Thinking Drinking_Focus Gp Topic guide_Ethics_v2 Sub Amendment 1, 20/03/2014

Indicative topics for groups involving Care Staff

These are the suggested discussion topics, but within the focus groups participants may choose to move away from these and discuss other issues.

1. Opening Questions

- Can you tell me your name (or the name you would like to be called by for today) and what your favourite drink is?

2. Introductory Questions

Play: A nice cup of tea in the morning (1st chorus only, Appendix 1)
Binnie Hale (http://www.youtube.com/watch?v=SE5Iflkl_oA)

- When do you like to drink a cup of tea?

  Probe: How do you like to drink your tea?

  Probe: What other drinks do you like?

3. Transition Questions

- Thinking about your residents, what sort of drinks do they like?

  Probe: How easy is it to cater for individual tastes?

4. Key Questions

- In what ways do you make sure residents drink enough?

  Probe: What sort of things help residents to drink?

  Probe: What actions have you found helpful?

- Are there times when residents just don't want to drink?

  Probe: What sort of thing can discourage them from drinking? Why is this?

  Probe: What about residents' worries about being incontinent?

- What sorts of reasons would you give to residents about why they should drink well?

  Probe: What kinds of problems occur by not drinking enough?

5. Ending Questions

- Considering everything we have talked about, what one thing do you suggest would help residents to drink more?
- Review purpose of the study, summarise, and ask:
  Is there anything else we should have talked about?

6. Conclusion

- What happens now: listen to recordings, transcriptions, return with summary [date and time], analysis, publication.
- Thank you – time, contributions, my availability following the focus group for any further questions, concerns.

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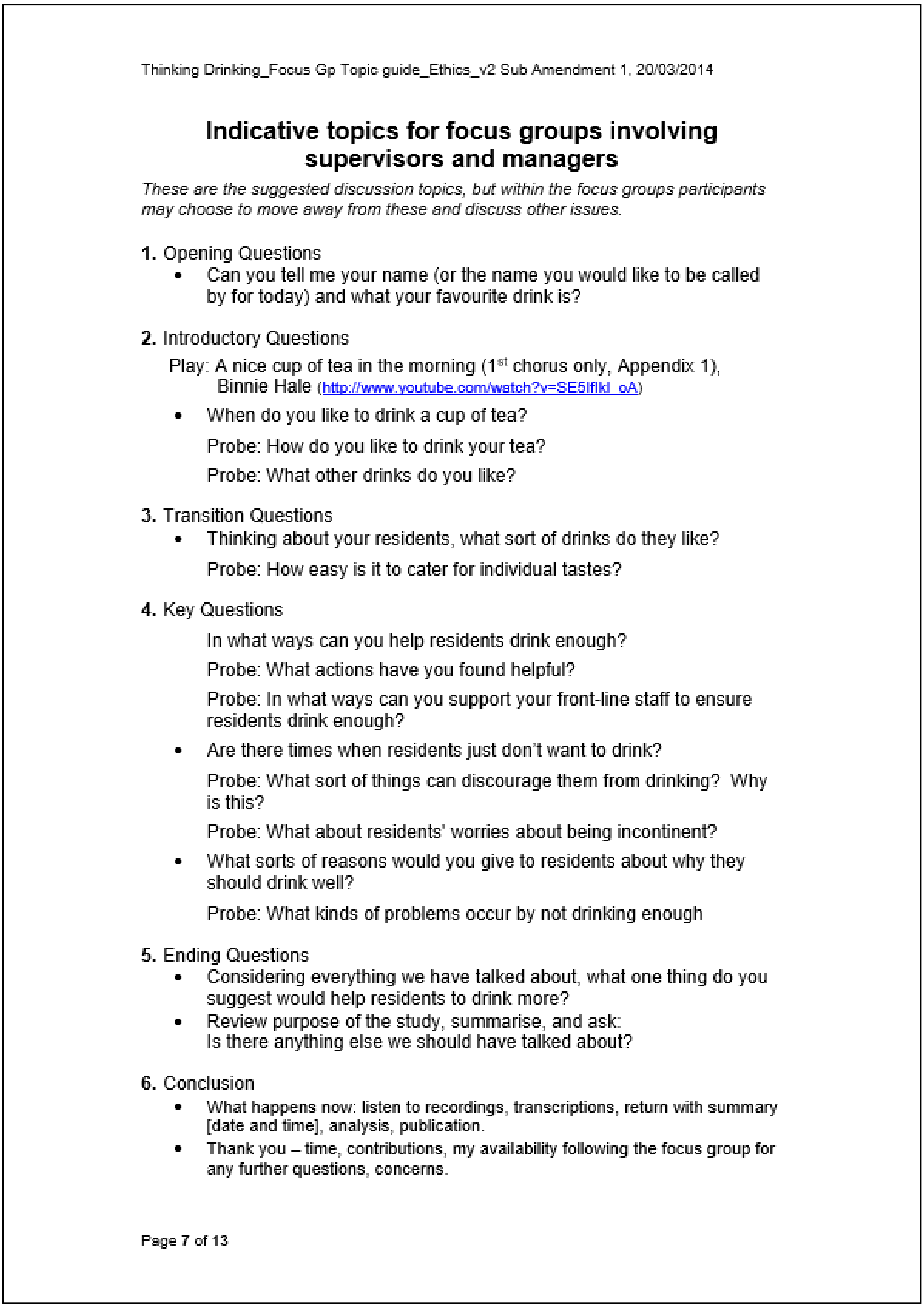

Thinking Drinking_Focus Gp Topic guide_Ethics_v2 Sub Amendment 1, 20/03/2014

Indicative topics for focus groups involving supervisors and managers

These are the suggested discussion topics, but within the focus groups participants may choose to move away from these and discuss other issues.

1. Opening Questions

- Can you tell me your name (or the name you would like to be called by for today) and what your favourite drink is?

2. Introductory Questions

Play: A nice cup of tea in the morning (1st chorus only, Appendix 1), Binnie Hale (http://www.youtube.com/watch?v=SE5Iflkl_oA)

- When do you like to drink a cup of tea?

  Probe: How do you like to drink your tea?

  Probe: What other drinks do you like?

3. Transition Questions

- Thinking about your residents, what sort of drinks do they like?

  Probe: How easy is it to cater for individual tastes?

4. Key Questions

In what ways can you help residents drink enough?

Probe: What actions have you found helpful?

Probe: In what ways can you support your front-line staff to ensure residents drink enough?

- Are there times when residents just don't want to drink?

  Probe: What sort of things can discourage them from drinking? Why is this?

  Probe: What about residents' worries about being incontinent?

- What sorts of reasons would you give to residents about why they should drink well?

  Probe: What kinds of problems occur by not drinking enough

5. Ending Questions

- Considering everything we have talked about, what one thing do you suggest would help residents to drink more?
- Review purpose of the study, summarise, and ask:
  Is there anything else we should have talked about?

6. Conclusion

- What happens now: listen to recordings, transcriptions, return with summary [date and time], analysis, publication.
- Thank you – time, contributions, my availability following the focus group for any further questions, concerns.

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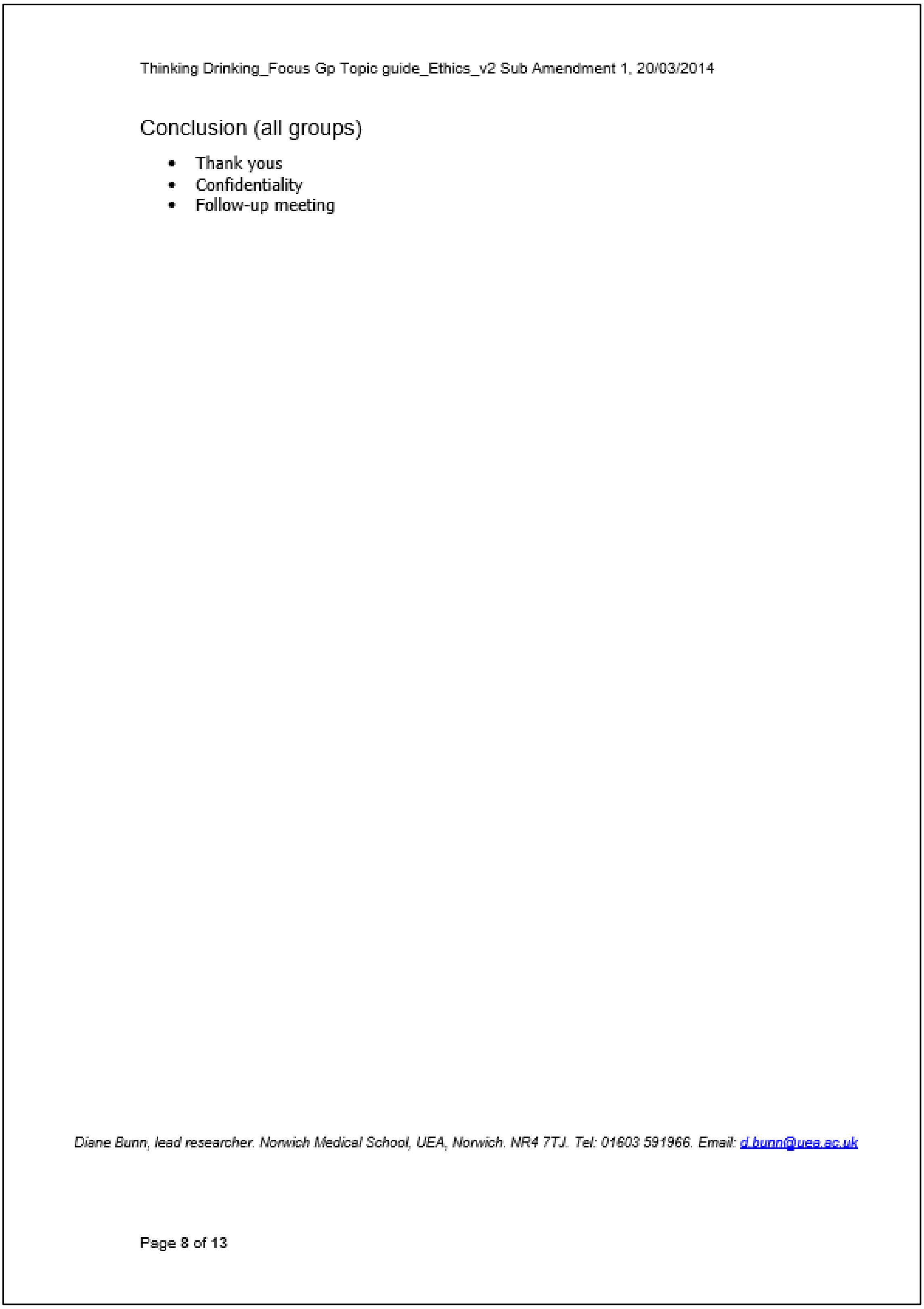
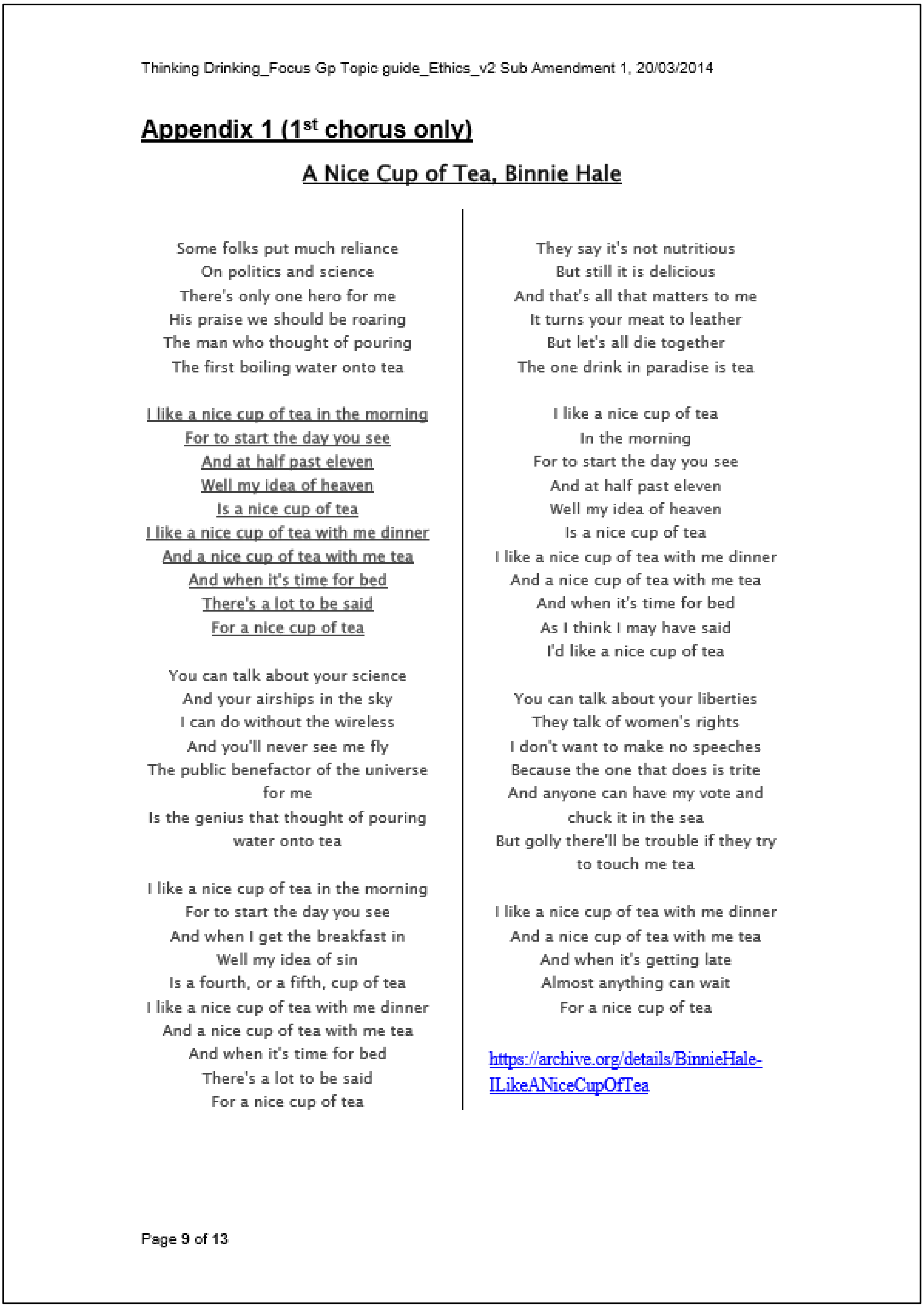


Conclusion (all groups)

- Thank yous
- Confidentiality
- Follow-up meeting



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Appendix 1 (1st chorus only)

A Nice Cup of Tea, Binnie Hale

Some folks put much reliance
On politics and science
There's only one hero for me
His praise we should be roaring
The man who thought of pouring
The first boiling water onto tea

I like a nice cup of tea in the morning
For to start the day you see
And at half past eleven
Well my idea of heaven
Is a nice cup of tea
I like a nice cup of tea with me dinner
And a nice cup of tea with me tea
And when it's time for bed
There's a lot to be said
For a nice cup of tea

You can talk about your science
And your airships in the sky
I can do without the wireless
And you'll never see me fly
The public benefactor of the universe for me
Is the genius that thought of pouring water onto tea

I like a nice cup of tea in the morning
For to start the day you see
And when I get the breakfast in
Well my idea of sin
Is a fourth, or a fifth, cup of tea
I like a nice cup of tea with me dinner
And a nice cup of tea with me tea
And when it's time for bed
There's a lot to be said
For a nice cup of tea

They say it's not nutritious
But still it is delicious
And that's all that matters to me
It turns your meat to leather
But let's all die together
The one drink in paradise is tea

I like a nice cup of tea
In the morning
For to start the day you see
And at half past eleven
Well my idea of heaven
Is a nice cup of tea
I like a nice cup of tea with me dinner
And a nice cup of tea with me tea
And when it's time for bed
As I think I may have said
I'd like a nice cup of tea

You can talk about your liberties
They talk of women's rights
I don't want to make no speeches
Because the one that does is trite
And anyone can have my vote and chuck it in the sea
But golly there'll be trouble if they try to touch me tea

I like a nice cup of tea with me dinner
And a nice cup of tea with me tea
And when it's getting late
Almost anything can wait
For a nice cup of tea

https://archive.org/details/BinnieHale-ILikeANiceCupOfTea

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Appendix 2 (photographs)

Picture 1: Traditional tea-time
Photographed by Diane Bunn, 16/03/2014

Thinking Drinking_Focus Gp Topic guide_Ethics Sub Amendment 1, v3, 17/03/2014

Picture 2: Institutional provisions of drinks
Photograph taken by Diane Bunn at the UEA, 12/03/2014

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Picture 3, Social coffee.

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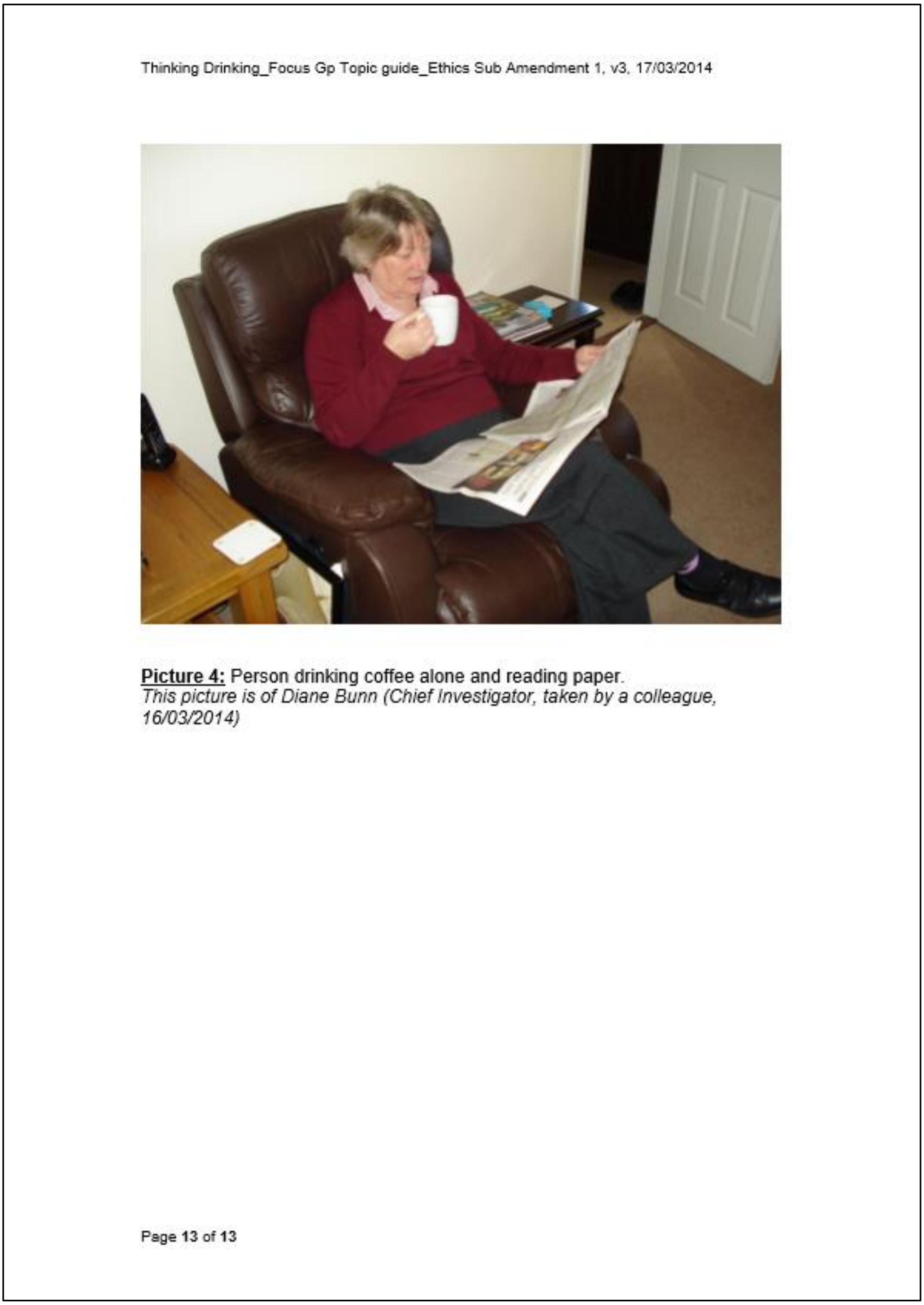

Thinking Drinking_Focus Gp Topic guide_Ethics Sub Amendment 1, v3, 17/03/2014

Picture 4: Person drinking coffee alone and reading paper.
This picture is of Diane Bunn (Chief Investigator, taken by a colleague, 16/03/2014)

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