A qualitative investigation of the acceptability and feasibility of the Public Health England urinary tract infection intervention for older adults.

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A thesis submitted in partial fulfilment of the requirements of the University of the West of England, Bristol for the degree of Professional Doctorate in Health Psychology.

This research programme was carried out in collaboration with Public Health England

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September 2020

Acknowledgements

I would like to start by thanking all of my Public Health England colleagues who have supported me throughout my doctoral experience. Having such supportive colleagues has made this challenge enjoyable and one I will never forget. I would like to give a special thanks to Rosie Allison, Petronella Downing, Rebecca Owens, Donna Lecky, Emily Cooper, Cath Hayes, Rowshonara Syeda, Katherine Butler, Julie Brooke, Vicki Young, Carla Brown, Viviana Finistrella, Karen Shaw and others in PHE and the Primary Care and Interventions Unit who have all played their part in sending me papers, giving me advice, signing forms, reading drafts and checking in on me. An even bigger thank you to my workplace supervisor Cliodna McNulty, who saw something in me worth investing in and moved mountains to make this possible – for this experience I owe you everything.

To my University supervisors, Heidi Williamson and Diana Harcourt, thank you for all of your advice and support throughout this process. Thank you to the teams in Gloucestershire and East Kent who supported this work. Thank you to all of the care staff, general practice staff, older adults and stakeholders who took the time to speak to me and contribute valuable insights. Thank you to Fran Husson for reviewing my interview schedules and providing valuable comments.

I would like to thank my parents and my family for giving me drive and motivation to succeed. Throughout my childhood their support and enthusiasm towards my studies has been invaluable.

Finally, I would like to thank my husband who has supported me to pursue my career goals. His love and blind faith in my ability has been my strongest driving force for the past decade and I can't thank him enough.

To all of the above, who have contributed to this work in some way, I dedicate this to you – thank you.

Abstract

Background and aims

Rates of *Escherichia coli (E. coli)* bacteraemia are rising and the highest rates of antimicrobial resistance (AMR) for urinary tract infections (UTIs) occur in older adults. In response to this, in 2017, I developed a UTI leaflet for older adults and their carers. The aim of this qualitative study was to explore the acceptability and feasibility of using this leaflet in care home and general practice settings.

Method

A qualitative study was conducted across two English regions using interviews and focus groups with care home staff, older adults, general practice staff, and other influential stakeholders (e.g. national society representatives, commissioners and experts). Interview schedules were informed by the Theoretical Domains Framework (TDF) to explore all behavioural determinants, and key topics identified in the needs assessment. Discussions reflected on experiences of using and implementing the leaflet. Inductive thematic analysis was used to develop key themes. Using a deductive approach, key themes were then grouped with their corresponding TDF domains and applied to the Behaviour Change Wheel (BCW) to make intervention recommendations.

Results

Ninety-three participants from across Gloucestershire and East Kent took part, including national and regional stakeholders. Three higher order themes emerged; use and implementation of UTI resources including the leaflet, identifying/diagnosing a UTI, and managing and/or treating a UTI.

The leaflet was seen as a useful infection prevention and control tool that tended to be used alongside diagnostic tools, but was not considered appropriate for all older adults. Intentions to use the leaflet were contingent on its provision in multiple formats, and suggestions for content improvements were discussed, such as removal of alarmist terminology, inclusion of antibiotic course length, D-mannose supplements and vaginal atrophy.

Barriers to implementation included lack of time and resource for commissioners to visit each care home and general practice, and poor working relationships between both settings.

There were difficulties identified by care staff and general practice staff in diagnosing UTI in older adults, with a reliance on inappropriate diagnostic tests. UTI management varied across clinicians, and patients' continence status influenced self-care and diagnosis. Hydration was perceived to be

an important self-care and prevention strategy. Thus, highlighting the importance of retaining these topics in the leaflet.

Conclusions

Commissioners should provide the leaflet in electronic and hard copy formats, and promote the leaflet during training sessions for care staff and clinicians. Regional strategies should include plans for dissemination to care homes as well as targeted training and monitoring of uptake.

The leaflet is now modified and being piloted for use in community pharmacy and now contains information for all ages. This leaflet contains information on antibiotic course length, D-mannose supplements and vaginal atrophy.

Intervention recommendations based on BCW, include educational training resources for care staff on asymptomatic bacteriuria, UTI identification and management, interventions to improve residents' hydration levels alongside continence regimes, diagnostic guidelines for residents with dementia, and a urine submission form for general practices which include patient age and signs and symptoms to ensure appropriate triage.

Context and study conception

I work as a Research Project Support Officer for Public Health England's (PHE) Primary Care and Interventions Unit (PCIU). The remit of the PCIU is to design, develop and evaluate interventions for primary care professionals and the general public, with the aim of tackling antimicrobial resistance (AMR).

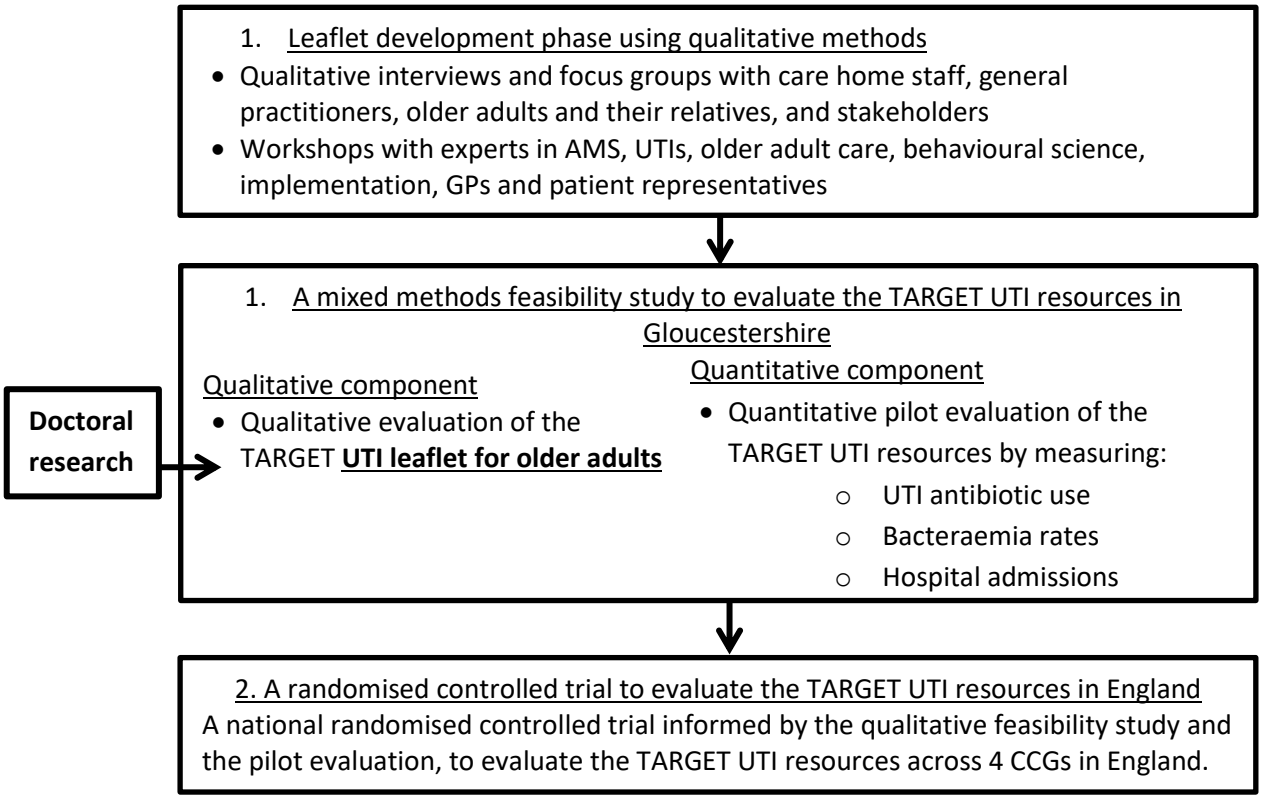
One of the main programmes of work in the PCIU is the TARGET Antibiotics Toolkit (Treat Antibiotics Responsibly; Guidance, Education, Tools; www.rcgp.org.uk/targetantibiotics) (Public Health England, 2012b). TARGET is a suite of resources for primary care clinicians, primary care commissioners and the general public designed to help clinicians optimise their antibiotic prescribing and to help the general public self-care and prevent future common infections. I have worked on the TARGET programme for over five years, conducting exploratory needs assessments, and developing and evaluating interventions (Leah Ffion Jones, Cooper, & McNulty, 2018; Leah Ffion Jones, Meredith K. D. Hawking, et al., 2018; Leah Ffion Jones, Rebecca Owens, et al., 2018).

In 2015/16 the PCIU began developing resources specifically targeting urinary tract infections (UTIs). This was in response to increasing rates of *Escherichia coli* (*E. coli*) blood stream infections (Public Health England, 2016a). The PCIU developed a UTI patient information leaflet for uncomplicated UTIs in women under the age of 65, and a UTI antibiotic prescribing audit for general practice; all of which are freely available on the TARGET website. In 2017, I became involved in the development of diagnostic tools to help primary care clinicians accurately diagnose UTIs in adults, published in November 2018 (Public Health England, 2018). Currently, with the assistance of a consultant medical microbiologist, I am leading on the re-development of an interactive and educational UTI workshop for primary care clinicians.

Alongside the above, my primary work focus in 2017/18 was leading on **the development of a UTI patient information leaflet for older adults and their carers** to provide education about the signs and symptoms of UTI, self-caring without antibiotics, prevention of future UTIs and when to seek further help (safety netting). As part of this project, I lead on all aspects of the management of the project including the protocol development, I developed the interview schedules and I conducted focus groups and interviews with care home staff, care home residents and their families, and relevant stakeholders to discuss the identification, management and prevention of UTIs, including any barriers and facilitators. Following each discussion, I made iterative

modifications to the Uncomplicated[1] Older Adult UTI leaflet, and agreed on content with a steering group of experts including geriatricians, general practitioners (GPs), pharmacists, nurses, infection prevention leads and other health professionals. **The determination of the acceptability and feasibility of this UTI leaflet for older adults is the focus of this doctoral thesis.**

The work I have set forth in this thesis as my doctoral research forms a qualitative **component** of a larger mixed method feasibility study to evaluate the full suite of TARGET UTI resources on a small scale in Gloucestershire Clinical Commissioning Group (CCG), see Figure 1 for an illustration of how this research aligns with the other UTI work of the PCIU. The quantitative aspect of this feasibility study is still ongoing whilst antibiotic prescribing data is collected ready for analysis in the summer of 2020. My feasibility study will inform a large national randomised controlled trial (RCT) following my doctorate. The findings from this feasibility study have the potential to inform the design and methodological components of the nested qualitative component of the RCT, such as recruitment and interview schedules, as well as further adaptations to the leaflet. I have managed and lead on all aspects of the mixed methods feasibility study including protocol development, design, interview schedule development, data collection, analysis and write up.



[1] Cases of UTI in non-pregnant women under the age of 65 are considered uncomplicated. Therefore, this refers to a leaflet developed specifically for women under 65. Complicated UTIs can refer to cases with increased risk of complications i.e. all men, pregnant women, people with anatomical or functional abnormalities of the urinary tract, indwelling urinary catheters, renal disease and immunocompromising disease.

Figure 1: Illustration of how my doctoral research fits in with the wider context of UTI research in the PCIU

Contents

1.0 Introduction

1.0.1 The problem of antimicrobial resistance and urinary tract infections in older adults

Antimicrobial resistance (AMR) is a global health threat (O'Neill, 2016). It is estimated that by 2050, ten million people will die annually from resistant infections, more than double that of cancer, with a global cost of 100 trillion USD in terms of lost global production if no action is taken (O'Neill, 2016). The UK five-year Antimicrobial Stewardship (AMS) Strategy focuses on the importance of slowing the development and spread of resistant infections by increasing awareness, developing new diagnostics and novel therapies, promoting stewardship, and developing infection prevention initiatives to conserve the effectiveness of treatments (Department of Health, 2013; HM Government, 2019a, 2019b). The intervention assessed in this study **(UTI patient information leaflet for older adults and their carers)** is designed to aid accurate diagnosis, promote self-care and prevent future infection, thus conserving the effectiveness of antibiotics.

Urinary tract infections (UTIs) are one of the most common causes of hospitalisation in care home residents, and therefore pose a significant threat to life in this age group (Genao & Buhr, 2012). UTIs are usually caused by bacteria, most commonly a type of gram-negative[2] bacteria called *Escherichia coli* (*E. coli*), entering the urinary tract, which can lead to *E. coli* bacteraemia (*E. coli* in the blood), sepsis and death (J. K. Abernethy et al., 2015). The highest rates of *E. coli* bacteraemia in England are observed amongst older adults (75 years and over) (Public Health England, 2016b), with catheterisation, previous UTIs, healthcare exposures, or antibiotic use as key risk factors (J. Abernethy et al., 2016). Infection surveillance shows that since 2010 in the UK, *E. coli* blood stream infections rates have increased, the total number of cases reported in 2018/19 is an increase of 5.2% from 2017/18, and an increase of 33.8% from 2012/13 (Public Health England, 2019).

In a prospective Norwegian study, researchers recorded the rate of healthcare-associated infections (HCAIs) in care homes from 690 infection incidents and 1,045 controls. The overall rate of new HCAIs was 0.5% of residents per day and antibiotics were given in 94% of cases; 38% of the

[2] Gram negative bacteria are characterised by a thin cell wall and appear red or pink following a Gram stain procedure as they do not retain the crystal violet dye. (National Institute for Allergy and Infectious Diseases, 2016)

HCAIs were UTIs, however the data collected for this study was over the winter months which does not account for seasonal variance in infections (Eriksen et al., 2007). The risk of UTIs linked to bacteraemia in older adults was also reported in a 2016 sentinel surveillance study by Abernethy et al (2016), who showed that half of *E. coli* cases were related to the urogenital tract and around half occurred in patients 75 years and over. Furthermore, antimicrobial therapy was the most commonly reported prior healthcare exposure in one third of patients, suggesting that prior antibiotic use increases the risk of developing *E. coli* UTIs. UTIs are also more likely to recur within 12 months of the first infection (Al-Badr & Al-Shaikh, 2013) with antibiotic resistance at its greatest one month following antibiotic treatment (Costelloe, Metcalfe, Lovering, Mant, & Hay, 2010). Antibiotic resistant *E .coli* UTIs are symptomatic for longer, even when susceptible antibiotics are given, and are more likely to lead to re-consultations which increases workload in general practice (C. C. Butler et al., 2006).

There remains a difficult balance between the clinical empirical management of UTIs using broad-spectrum antibiotics in older adults and the development of antibiotic resistance in the community. Inappropriate antibiotic use is encouraged by bacteria's increasing resistance to narrow spectrum antibiotics which limits available treatment options in older adults (Augustine & Bonomo, 2011). Indeed, Trimethoprim (first line antibiotic treatment for UTI prior to 2015) non-susceptibility is reported to be 40.5% in *E. coli* blood isolates, which increases up to 60.9% when associated with previous healthcare exposure in the four weeks prior to use (J. Abernethy et al., 2016). Due to the reported increase in resistance to Trimethoprim, the NICE/PHE antibiotic management guidance for UTIs changed the first line recommended treatment in 2015 to Nitrofurantoin, with Trimethoprim as second line treatment if susceptibilities are known (National Institute for Health and Care Excellence & Public Health England, 2018).

There are further difficulties associated with the identification and diagnosis of UTIs in older adults. In institutionalised older adults, prevalence of asymptomatic bacteriuria, defined as the presence of bacteria in the urine without apparent symptoms (Lindsay E. Nicolle, 1997), can range from 15-35% in men and 25-50% in women (L. Nicolle, 2019; Lindsay E. Nicolle, 1997). There is no evidence of decreased survival due to asymptomatic bacteriuria, (L. E. Nicolle, Mayhew, & Bryan, 1987) in fact there is evidence to suggest that asymptomatic bacteriuria may be a protective factor against UTIs (Lindsay E. Nicolle et al., 2005). Research has demonstrated that treating asymptomatic bacteriuria in older adults with antibiotics is associated with increased rates of reinfection, adverse antimicrobial drug effects and isolation of increasingly resistant organisms in the recurrent infection when compared with no antibiotics (L. E. Nicolle et al., 1987).

Furthermore, L. E. Nicolle et al. (1987) report no differences in genitourinary morbidity or mortality between the antibiotic and no antibiotic groups (L. E. Nicolle et al., 1987). Hence, all current guidelines state that asymptomatic bacteriuria in older adults should not be treated with antimicrobial therapy (National Institute for Health and Care Excellence & Public Health England, 2018; Public Health England, 2017).

Due to high rates of asymptomatic bacteriuria in institutionalised older adults, urine dipsticks are an inappropriate tool to aid UTI diagnosis (Sundvall et al., 2014). The presence of leukocytes and nitrites in a urine sample may only indicate the presence of asymptomatic bacteriuria. Hence, all current guidelines discourage use of urine dipsticks to aid UTI diagnosis in this age group, and instead emphasise laboratory urinalysis for confirming antibiotic susceptibility for symptomatic patients only (National Institute for Health and Care Excellence & Public Health England, 2018; Public Health England, 2018).

Despite strong evidence to suggest that antimicrobial therapy to treat asymptomatic bacteriuria is unnecessary and potentially harmful, urine dipsticks are frequently used among primary care clinicians and care home staff to inform diagnostic decision making around UTIs (L.F. Jones et al., 2020). This is sometimes as a result of cognitive impairment preventing patients from articulating their symptoms, it can also be due to non-specific symptoms and clinician uncertainty (Walker, McGeer, Simor, Armstrong-Evans, & Loeb, 2000). As a result, a proportion of older adults are misdiagnosed with UTIs and therefore receive unnecessary UTI antibiotics (Flokas et al., 2017; NHS Nottingham, 2017), which is further perpetuating the problem of AMR (C. Butler et al., 2007; Costelloe et al., 2010).

1.0.2 Strategies to reduce *Escherichia coli* infections

In recognition of the imposing threat of AMR and *E. coli* infections on public health, the Department of Health has set out a plan that aims to halve Gram Negative Bloodstream Infections (GNBSIs) by 2023/24 (HM Government, 2019b). In response, the NHS Quality Premium for 2017/2019 set the target of reducing *E. coli* infections by 10% at CCG level (NHS England, 2017).

Prevention has a key part to play in reducing UTIs (Scottish Antimicrobial Prescribing Group, 2016). Evidence for specific prevention strategies is limited. However the Scottish Antimicrobial Prescribing Group recommend preventing the spread of bacteria from the gut into the bladder by maintaining good genital hygiene in women (e.g. wiping from front to back (Amiri, Rooshan, Ahmady, & Soliamani, 2009; Scholes et al., 2000)) and washing the external vagina area before and after sex (Amiri et al., 2009; Scholes et al., 2000). Eating healthily can also help to avoid constipation (Charach, Greenstein, Rabinovich, Groskopf, & Weintraub, 2001) which can help

prevent UTIs by allowing the bladder and urethra to fully empty. There is currently little evidence to support the use of cranberry products in the prevention of UTIs (Clinical Knowledge Summaries, 2015; Jepson, Mihaljevic, & Craig, 2000; National Institute for Health and Care Excellence, 2018), however there is some evidence to suggest D-mannose, a dietary sugar supplement, may be an effective alternative to antibiotics for treating recurrent UTIs (Kranjcec, Papes, & Altarac, 2014).

There is also some evidence to suggest that adequate hydration in older adults can help prevent UTIs (Beetz, 2003; Hooton et al., 2018; Natural Hydration Council, 2013). Older adults are at particular risk of dehydration due to reduced thirst mechanisms, increased fluid loss due to poor renal function, medication side effects, difficulty swallowing, incontinence, poor mobility/dexterity, and living in an institution (Reed, Clarke, & Macfarlane, 2012). An NHS hydration audit in community pharmacy has highlighted that additional strategies are needed to reach housebound older adults and those in residential care, who are not able to obtain hydration advice from their community pharmacy (Special Pharmacy Service, 2017).

1.0.3 The role of health psychology in the management of AMR and UTI

Despite the medical and microbiological nature of this topic, health psychology has a vital role to play in improving diagnosis, management and AMS of UTIs. Using psychological theory, key behavioural determinants can be identified for both clinicians and patients of their diagnostic, treatment, self-care and preventative behaviours, which can inform the development of tailored public health interventions (Tonkin-Crine, Walker, & Butler, 2015). Experts recommend that to improve AMS it is important to investigate beyond understanding the effectiveness of interventions, which in a public health context lacks the explanation of how and why an intervention may work in a real life setting (Hewitt, Sims, & Harris, 2012). A person-based approach should be used to utilise expertise from patients and stakeholders, and a qualitative exploration of context, background, environment and beliefs to understand how and why interventions may work (Hewitt et al., 2012; Tonkin-Crine et al., 2015; Yardley, Morrison, Bradbury, & Muller, 2015).

Yardley argues that even topic experts are not best placed to design interventions as it is difficult to anticipate all potential priorities for a target audience (Yardley, Morrison, et al., 2015). Therefore , Yardley's person-based approach (Yardley, Morrison, et al., 2015) seeks to ground intervention development in the perspectives and context of the target audience by utilising qualitative methods as a mode of investigation. Thus, it provides a useful approach for researchers developing AMS and infection interventions. The person-based approach is a similar

yet distinct approach to Rogers' person-centred approach whereby patient therapy is directed by the individual (Rogers, 1979). Rogers states that an individual has within him or herself vast resources for self-understanding and for changing attitudes and behaviours, which a therapist can facilitate by creating a relationship built on empathetic understanding (Rogers, 1979). The principles of a person-centred approach outlined by Rogers, are useful for a therapeutic setting, the principles of a person-based approach as outlined by Yardley builds on Rogers' ethos for the purpose of research and developing interventions. Hence why the person-based approach is utilised in this study alongside a behavioural framework, to gain the perspectives of the target audience and therefore provide an informed basis on which to adapt interventions and identify opportunities for intervention (Yardley, Ainsworth, Arden-Close, & Muller, 2015; Yardley, Morrison, et al., 2015).

The Theoretical Domains Framework (TDF) is a behavioural framework used to explore human behaviour and the implementation of interventions (Cane, O'Connor, & Michie, 2012). The 14 domains of the TDF represent the amalgamation of theoretical constructs from preceding behavioural models and theories, providing consistency of terminology and an all-encompassing model of behaviour which can be applied in any setting. The simpler COM-B model ('Capability', 'Opportunity', 'Motivation' and 'Behaviour') (Michie, Atkins, & West, 2014) which can be mapped on to the TDF, provides a basic framework of exploration for non-experts. Furthermore, once the relevant TDF or COM-B domains are understood within a given context, these can then be applied to the Behaviour Change Wheel (BCW) (Michie et al., 2014) and the Behaviour Change Technique taxonomy (BCTT) (Michie et al., 2013). Depending on the behavioural domains identified, behaviour change techniques and intervention functions are selected in order to inform intervention development and policy categories are selected to inform delivery, therefore ensuring that any interventions developed are grounded in the exploratory findings.

Arguably, the strength of the TDF and the BCW as an all-inclusive model is equally its limitation, rendering the model difficult to operationalise and test (Jane Ogden, 2016). Furthermore, critics cite the fact that the model has synthesised the body of behaviour change evidence while it is still in its infancy, and call for further research to be conducted in behaviour change before synthesising potentially weak or sparse evidence (Jane Ogden, 2016). Nevertheless, using the TDF and BCW, some studies and reports have been able to extrapolate influential findings to advance our understanding of AMS and to inform important interventions (Borek et al., 2019; Public Health England, IN PRESS). For example, a PHE report (Pinder, Sallis, Berry, & Chadbourn, 2015) examining antibiotic prescribing behaviours in healthcare settings, identified a number of

important behavioural domains from the TDF that could be targeted in clinician-facing interventions. The report suggests that areas of priority should be:

1. addressing clinicians' fear of the consequences of not prescribing and missing a serious infection
2. improving the skills of healthcare staff to communicate the issue of AMR and the importance of appropriate use of antibiotics during consultations
3. enabling clinicians to refrain from issuing a prescription where they believe it is not appropriate

Additionally, the report suggests that any intervention must be sensitive to the time and resource pressures on clinicians.

The same PHE report (Pinder et al., 2015) used the COM-B model to describe patients' use of antibiotics. The report identified that patients need: skills to use and access self-help tools; access to the right help at the right time; self-care skills, and knowledge of safety netting information and how to use antibiotics sparingly. One of the short term intervention recommendations in the report was to make further improvements to one of the TARGET leaflets called 'Treating Your Infection, Respiratory Tract Infections' (TYI-RTI) (Public Health England, 2012a).

Since the Pinder et al. (2015) report, the TYI-RTI leaflet has been successfully adapted into a pictorial format for people with learning disabilities and adapted for women with UTIs called the 'Treating Your Infection, Urinary Tract Infections' (TYI-UTI) leaflet for uncomplicated UTIs in women under 65) (Public Health England, 2012a). Directly influenced by the Pinder et al report, each TARGET leaflet contains self-care information, prevention advice, safety netting information to advise patients in case of a serious infection, and basic information around AMR. The leaflets provide clinicians with a simple resource to be issued during a consultation as a communication tool, and can be used when they believe an antibiotic is not required.

1.0.4 A critical exploration of leaflet use

The utility of information leaflets to deliver public health-related messages has been debated within the field and thus evidence of their effectiveness warrants some critical discussion.

Randomised controlled trials (RCTs) have shown that reassurance from a general practitioner (GP) and sharing patient information leaflets on respiratory conditions can safely reduce unnecessary antibiotic prescribing (Francis et al., 2009; Macfarlane et al., 2002). Furthermore, patient information leaflets can be an effective way of providing health knowledge to the public, and can be highly valued by patients (Humphris & Field, 2003; Moerenhout et al., 2013). Indeed, in a

sample of 1,415 primary care clinicians, over 50% reported using infection related patient information leaflets during consultations (Owens, Jones, Moore, Pilat, & McNulty, 2017), and according to website statistics, the TARGET Treating Your Infection (TYI) leaflets for both uncomplicated UTIs and respiratory tract infections (RTIs) are the two most popular interventions in the TARGET Antibiotics Toolkit (Public Health England, 2012b) and are therefore disseminated nationally for use in primary care.

In 2017, ninety two percent of CCGs reported actively promoting the TYI leaflet for RTIs (Allison et al., 2018) and, in the same study, commissioners reported valuing the leaflets. They argued that they facilitate patient education, aid GP decision making, increase patient satisfaction with consultations, increase awareness and promote appropriate use of antibiotics, and are easy to implement due to their integration within GP clinical systems (Allison et al., 2018). Integration into GP clinical systems means that GPs can access the leaflets at the click of a button during a consultation. Leaflets can be allocated a 'Read code' or 'Snomed code' (codes corresponding to clinical terms), and use of the leaflet can be recorded in patients' clinical notes, which in turn can facilitate audit and inform practice improvement. However, commissioners were concerned that leaflets lack evidence of effectiveness in their regions due to lack of local evaluations and monitoring, therefore the impact on patient behaviour change is not understood at local levels (Allison et al., 2018).

It is unlikely that using a UTI information leaflet alone will reduce infection rates and therefore reduce resistance to UTI antibiotics. Therefore, it is important to note that the **UTI patient information leaflet for older adults and their carers,** that is the focus of this study, is part of a wider suite of UTI related resources for primary care, developed by PHE (Public Health England, 2012b). These include diagnostic tools for UTIs, UTI audits for antibiotic prescribing, an online learning module for primary care clinicians with continued professional development (CPD) accreditation, a workshop presentation, self-assessment checklist and the TYI leaflet for uncomplicated UTIs. However, it is down to individual choice as to which materials are used and implemented locally. A review of systematic reviews concluded that multifaceted interventions including audits, education and feedback are more effective compared to singular interventions (Boaz, Baeza, Fraser, & European Implementation Score Collaborative Group (EIS), 2011). Indeed, I concluded in my systematic review of interventions to reduce UTIs and *E. coli* bacteraemia in older adults across care settings (part of my doctoral studies), that multifaceted interventions were most effective compared to singular interventions in reducing UTIs for older adults across care settings (L. F. Jones, Meyrick, Bath, Dunham, & McNulty, 2018). This is why the present UTI

leaflet for older adults is intended to be used among other PHE UTI resources which, when used together, target a wider variety of behavioural determinants.

Providing knowledge and skills to a target group via a leaflet, for example, is important but does not always achieve the anticipated changes in behaviour (Wensing, van der Weijden, & Grol, 1998). Various implementation barriers can prevent a potentially useful intervention from being effective. These could include poor practice organisation, lack of time, colleagues' negative attitudes towards its use and content, or resistance from patients (Haines & Donald, 1998; Wensing et al., 1998).

Nevertheless, leaflets can act as a communication tool for clinicians to initiate a conversation for a no antibiotic decision or around future prevention strategies. Leaflets can also ensure that the patient does not leave the consultation empty handed and provides them with an action plan (Bunten, Hawking, & McNulty, 2015).

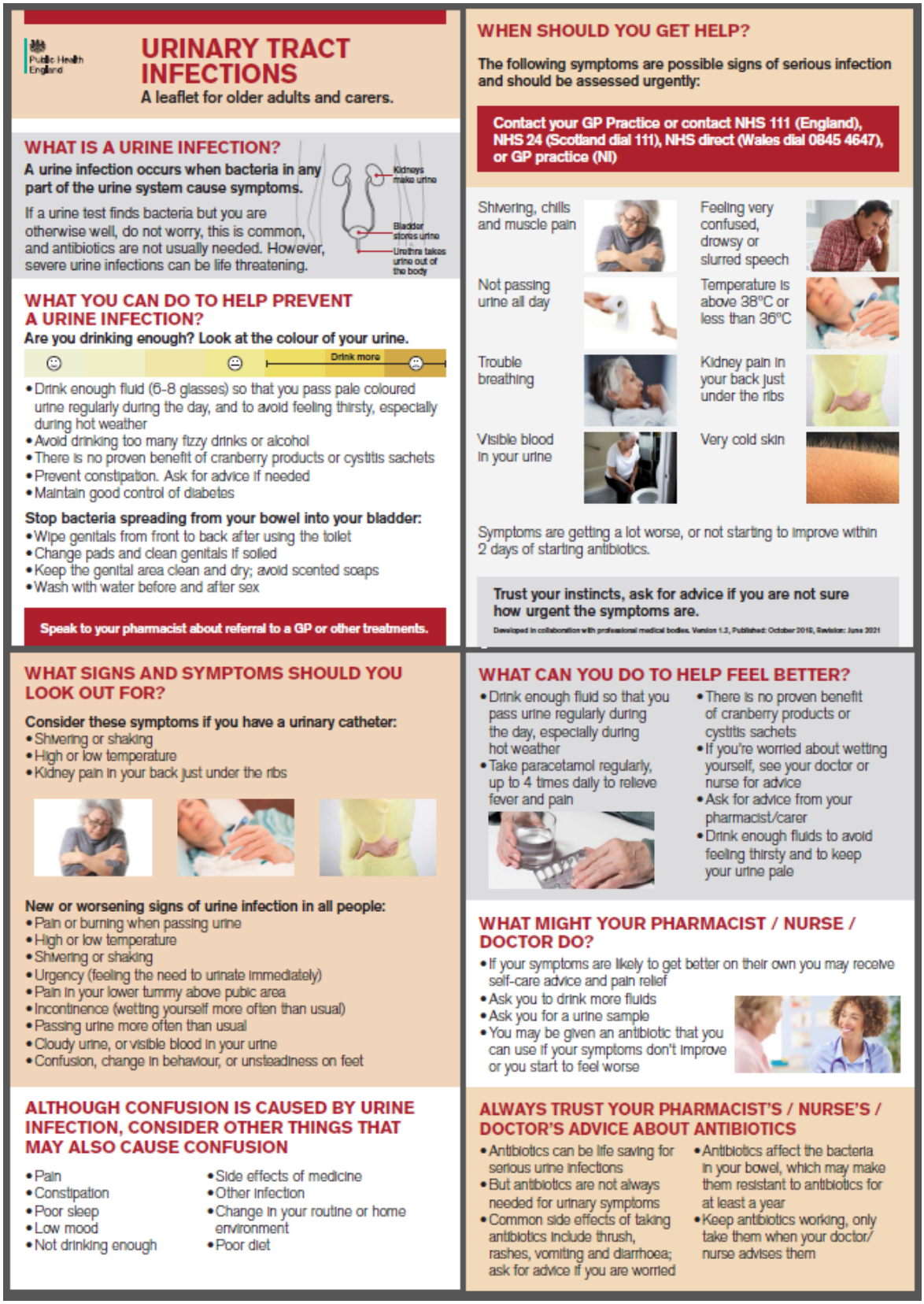
1.0.5 The importance of health literacy in developing the UTI leaflet for older adults

Older adults are one of the most likely groups at risk of poor health literacy along with others such as migrant and minority ethnic groups, and those with disabilities and long-term health conditions (Public Health England & UCL Institute of Health Equity, 2015). Poor health literacy means a lack of knowledge, skills and confidence to access, understand and implement health information and services (Public Health England & UCL Institute of Health Equity, 2015). A key consideration during the development stages of the leaflet was how to mitigate against issues of health literacy, as this declines with age (Kutner, Greenberg, Jin, & Paulsen, 2006). A dementia expert from the Yorkshire and Humber dementia clinical network reviewed the leaflet and advised that chunking information into sections could facilitate reading by older adults with mild dementia. Additionally, the leaflet contains diagrams and images to illustrate key messages, and for those older adults who may be from minority ethnic or migrant populations, the leaflet has now been translated into the 23 most commonly spoken languages in the UK (Public Health England, 2012b).

A key limitation of any leaflet is that those who lack the capacity to understand or act on the information it provides due to age related cognitive decline, cannot use it (Kaphingst, Goodman, MacMillan, Carpenter, & Griffey, 2014). For example, older adults with moderate to severe dementia, or older adults lacking in capacity or movement from a stroke. It was therefore crucial to ensure that the Older Adult UTI leaflet is also appropriate for carers who may be responsible for an older adult's personal hygiene and daily care. For this reason, the leaflet title also identifies carers as a target audience and it was developed with input from professional and family carers.

1.0.6 The development of 'Urinary Tract Infections; a Leaflet for Older Adults and Carers'

Based on the popularity of the other TARGET leaflets and recommendations from the PHE report (Pinder et al., 2015), in 2017 I led the research for developing a PHE UTI leaflet as an intervention for older adults and their carers, including extensive literature reviews, needs assessment and public involvement with GPs, care home staff, care home residents, their relatives and a wide range of stakeholders. The leaflet is an intervention designed for older adults at risk for UTI, or who have a suspected UTI or urinary symptoms. It is intended to educate older adults in the community or care homes, carers and family members on how to prevent UTIs, how UTIs develop and are diagnosed and managed, and to provide self-care and safety-netting advice on when to re-consult.



URINARY TRACT INFECTIONS

A leaflet for older adults and carers.

Public Health England

WHAT IS A URINE INFECTION?

A urine infection occurs when bacteria in any part of the urine system cause symptoms.

If a urine test finds bacteria but you are otherwise well, do not worry, this is common, and antibiotics are not usually needed. However, severe urine infections can be life threatening.

Kidneys make urine
Bladder stores urine
Urethra takes urine out of the body

WHAT YOU CAN DO TO HELP PREVENT A URINE INFECTION?

Are you drinking enough? Look at the colour of your urine.

Drink more

- Drink enough fluid (6-8 glasses) so that you pass pale coloured urine regularly during the day, and to avoid feeling thirsty, especially during hot weather
- Avoid drinking too many fizzy drinks or alcohol
- There is no proven benefit of cranberry products or cystitis sachets
- Prevent constipation. Ask for advice if needed
- Maintain good control of diabetes

Stop bacteria spreading from your bowel into your bladder:

- Wipe genitals from front to back after using the toilet
- Change pads and clean genitals if soiled
- Keep the genital area clean and dry; avoid scented soaps
- Wash with water before and after sex

Speak to your pharmacist about referral to a GP or other treatments.

WHEN SHOULD YOU GET HELP?

The following symptoms are possible signs of serious infection and should be assessed urgently:

Contact your GP Practice or contact NHS 111 (England), NHS 24 (Scotland dial 111), NHS direct (Wales dial 0845 4647), or GP practice (NI)

Shivering, chills and muscle pain

Feeling very confused, drowsy or slurred speech

Not passing urine all day

Temperature is above 38°C or less than 36°C

Trouble breathing

Kidney pain in your back just under the ribs

Visible blood in your urine

Very cold skin

Symptoms are getting a lot worse, or not starting to improve within 2 days of starting antibiotics.

Trust your instincts, ask for advice if you are not sure how urgent the symptoms are.

Developed in collaboration with professional medical bodies. Version 1.3, Published: October 2018, Revision: June 2021

WHAT SIGNS AND SYMPTOMS SHOULD YOU LOOK OUT FOR?

Consider these symptoms if you have a urinary catheter:

- Shivering or shaking
- High or low temperature
- Kidney pain in your back just under the ribs

New or worsening signs of urine infection in all people:

- Pain or burning when passing urine
- High or low temperature
- Shivering or shaking
- Urgency (feeling the need to urinate immediately)
- Pain in your lower tummy above pubic area
- Incontinence (wetting yourself more often than usual)
- Passing urine more often than usual
- Cloudy urine, or visible blood in your urine
- Confusion, change in behaviour, or unsteadiness on feet

ALTHOUGH CONFUSION IS CAUSED BY URINE INFECTION, CONSIDER OTHER THINGS THAT MAY ALSO CAUSE CONFUSION

- Pain
- Constipation
- Poor sleep
- Low mood
- Not drinking enough
- Side effects of medicine
- Other infection
- Change in your routine or home environment
- Poor diet

WHAT CAN YOU DO TO HELP FEEL BETTER?

- Drink enough fluid so that you pass urine regularly during the day, especially during hot weather
- Take paracetamol regularly, up to 4 times daily to relieve fever and pain
- There is no proven benefit of cranberry products or cystitis sachets
- If you're worried about wetting yourself, see your doctor or nurse for advice
- Ask for advice from your pharmacist/carer
- Drink enough fluids to avoid feeling thirsty and to keep your urine pale

WHAT MIGHT YOUR PHARMACIST / NURSE / DOCTOR DO?

- If your symptoms are likely to get better on their own you may receive self-care advice and pain relief
- Ask you to drink more fluids
- Ask you for a urine sample
- You may be given an antibiotic that you can use if your symptoms don't improve or you start to feel worse

ALWAYS TRUST YOUR PHARMACIST'S / NURSE'S / DOCTOR'S ADVICE ABOUT ANTIBIOTICS

- Antibiotics can be life saving for serious urine infections
- But antibiotics are not always needed for urinary symptoms
- Common side effects of taking antibiotics include thrush, rashes, vomiting and diarrhoea; ask for advice if you are worried
- Antibiotics affect the bacteria in your bowel, which may make them resistant to antibiotics for at least a year
- Keep antibiotics working, only take them when your doctor/ nurse advises them

Figure 2: A thumbnail of 'Urinary Tract Infections; A Leaflet for Older Adults and Carers'

The TDF (Cane et al., 2012) was used in the development of the leaflet in order to explore all behavioural determinants of potential leaflet use and behaviours around diagnosing, managing, caring and preventing UTI. The leaflet, modelled on the TARGET leaflet for uncomplicated UTIs, was modified iteratively after each interview, focus group or steering group meeting (see Appendix 1, or Figure 2 for final leaflet). Alongside the leaflet, there is a user guide designed for healthcare professionals and commissioners considering its use and a document containing full references and the rationale underpinning the leaflet (Appendix 2 and Appendix 3 respectively).

The leaflet contains an illustration of the urinary system, information on UTI prevention, signs and symptoms to look for, self-care advice, and safety netting advice. Each statement in the leaflet is underpinned by evidence. For example, there is little evidence to support the use of cranberry products for treating or preventing UTIs in older adults (Clinical Knowledge Summaries, 2015; Jepson et al., 2000; National Institute for Health and Care Excellence, 2018), therefore cranberry products were not recommended in the final leaflet, despite anecdotal evidence for its use from clinicians and patients in the needs assessment. The back page of the leaflet is dedicated to addressing when patients should seek help, which was identified as a concern during needs assessment work and via the PHE report (Pinder et al., 2015). A section also helps primary care staff and carers communicate key messages about antibiotic use and AMR to patients.

In this current qualitative study, which aimed to explore the acceptability and feasibility of the UTI leaflet for older adults, the TDF was employed to understand potential barriers and to identify how the leaflet and its implementation/dissemination can be improved to maximise its impact. Use of the Normalisation Process Theory (NPT) (May et al., 2009), was also considered as a tool to examine implementation. The NPT has four constructs that provide a framework for examining intervention implementation. These constructs are Coherence, Cognitive Participation, Collective Action, and Reflexive Monitoring. Whilst the NPT does overlap with the TDF, the NPT only provides a framework for examining implementation and does not very easily incorporate the context and circumstances of behaviour. I therefore decided to use the TDF as it incorporates implementation alongside exploration of behaviour, the perceived value of the intervention (Nilsen, 2015), and it links to the behaviour change wheel (Michie et al., 2014) allowing for intervention recommendations. The four constructs of the NPT are comparatively simplistic and do not allow for these additional functions.

In relation to the behaviour change wheel (Michie et al., 2014), the leaflet seeks to target the following intervention functions, using the following behaviour change techniques for each target audience, listed in Table 1.

Table 1

Intervention functions and behaviour change techniques from the BCTT (Michie et al., 2013), and target audience of the Older Adult UTI Leaflet

Intervention function	Target audience	Description	Desired behaviour change	Behaviour change technique
Education	Carers and older adults	Information and instructions about: a) The consequences of AMR if antibiotics are consumed unnecessarily b) How to recognise UTIs, care for and prevent UTIs, and recognise pyelonephritis or sepsis c) The unreliability of urine dipsticks as a diagnostic tool d) Expectations of consultations e) Use of paracetamol to alleviate symptoms	• Reduced demand for antibiotics • Increased self-care and prevention behaviours • Can recognise symptoms of pyelonephritis or sepsis • Reduced demand for urine dipsticks	a) Information about health consequences b) Instructions on how to perform a behaviour c) Pharmacological support
Enablement	Clinicians	The leaflet[3] enables clinicians to discuss the unreliability of urine dipsticks and the topic of AMR with older adults and/or their carers	• Increased discussions around AMR and unreliability of urine dipsticks • Reduced issuing of antibiotic prescriptions and use of urine dipsticks	• Credible source
Persuasion	Carers and older adults	Information is provided in the leaflet to persuade carers and older adults that:	• Consideration of other causes of urinary symptoms	a) Re-attribution • Information about social and

[3] The use of 'the leaflet' in this table refers to the 'Urinary Tract Infections; A Leaflet for Older Adults and Carers' leaflet, also referred to as the Older Adult UTI leaflet.

		a) confusion may be caused by other conditions. b) Unnecessary use of antibiotics can contribute to AMR	before assuming UTI • Reduced demand for antibiotics	environmental consequences
Environmental restructuring	Carers and clinicians	The leaflet itself is a resource added to the environment of carers and clinicians to use as a communication tool with older adults, or for carers to use on behalf of older adults with limited capacity.	• Increased use of the leaflet, and therefore the giving of the information listed above.	• Adding objects to the environment

The UTI leaflet for older adults was launched on the TARGET website (www.rcgp.org.uk/targetantibiotics) in June 2018, and formed an important part of improving the management of UTIs in line with the 2017/19 Quality Premium (NHS England, 2017). The other PHE leaflets have been qualitatively evaluated (Bunten et al., 2015; Lecky DM, Howdle J, Butler C, & McNulty CAM, 2020) and quantitatively evaluated as part of a multi-faceted intervention (McNulty et al., 2018), however the current leaflet has not been subject to a formal investigation of its acceptability and feasibility in primary care and care settings. This study therefore intends to provide a novel contribution to the field of primary care interventions and UTIs in older adults.

1.1 Research Question

Is the PHE UTI leaflet for older adults and their carers an acceptable and feasible intervention for national dissemination and use in primary care settings, care homes and the community?

1.2 Aims of the project

The aim of this project was to explore qualitatively the acceptability and the feasibility of using the PHE UTI leaflet as an educational tool to reduce UTI rates among older adults.

1.3 Objectives

1. To explore the views and experiences of potential users of the intervention (care home staff, general practice staff, older adults in care homes and the community) in order to:

    1. understand the acceptability and feasibility of the leaflet for use in primary care and care home settings

2. understand the perceived value of the leaflet
3. understand how use of the leaflet may interact with UTI diagnostic tools and other resources
4. identify any barriers and facilitators to using the leaflet in primary care, the community and care home settings
5. inform further developments to the leaflet
6. identify any indications of behaviour change in the carers and primary care clinicians
7. make recommendations for further intervention developments around UTIs in older adults

2. To explore the views and opinions of professional/influential stakeholders (e.g. Commissioners, professional society representatives (e.g. Royal College of General Practitioners), national body representatives (e.g. NHS England) and other relevant health professionals (e.g. pharmacists)) regarding this intervention in order to:

1. Understand the feasibility of implementing the leaflet regionally and nationally
2. Identify and understand the barriers and facilitators to regional and national implementation

2.0 Methods

2.0.1 Study design

This is a qualitative study using interviews and focus groups informed by the TDF, with care home staff, older adults in care and the community, general practice staff, and stakeholders. Discussions asked participants to reflect on their experiences and opinions of the leaflet. Interviews with influential and professional stakeholders explored their views on this intervention and its wider implementation.

An inductive thematic analysis (ITA) was used to establish key themes as inductive methods are best suited to exploration and discovery in order to develop theory (Morgan, 2013). A deductive theory driven approach (Virginia Braun & Clarke, 2006) was then employed whereby key themes were assigned to corresponding TDF domains which were applied to the BCW in order to make intervention recommendations.

2.0.1.1 Rationale for choice of design

Qualitative research is a form of inquiry employed to analyse language and behaviour, and information not often conveyed in quantitative data, such as beliefs, values, feelings, and motivations (Berkwits & Inui, 1998). Qualitative methods are therefore useful for understanding

patients and health care professional perspectives (R. Jones, 1995), and is necessary to understand and inform quantitative research (Berkwits & Inui, 1998).

As the aim of this present study is to understand leaflet users' beliefs, values, feelings and motivations towards the leaflet, a qualitative methodology was employed. Furthermore, the behaviours surrounding the use of the leaflet are complex, therefore a qualitative methodology will provide the detailed insight necessary to understand these behaviours. For example, implementation of the leaflet and other complementary resources and tools can occur in a variety of ways, such as: postage, training, emails, word of mouth; ground level implementation such as integration of the leaflet into GP systems, providing hard copies in consultations or waiting areas, blanket provision to residents, word of mouth across settings etc. Additionally, multiple factors could influence implementation of the leaflet such as: commissioner resource; staff turnover and staff time; the social pressures on health professionals and carers to use urine dipsticks to aid diagnosis; challenges associated with prevention, such as maintaining a good diet, hydration and personal hygiene, and variations in UTI management and practice, such as use of telephone consultations to diagnose and prescribe antibiotics (L.F. Jones et al., 2020). Therefore, understanding how barriers and facilitators impact implementation by health professionals and older adults is likely to be complex. This study was underpinned by the Theoretical Domains Framework which was used to inform the interview schedules and during the final stages of analysis, details of which can be found in sections 2.3.2 and 2.5 respectively.

The rationale for choosing a qualitative methodology here was driven by my pragmatist worldview. I wanted to complement the quantitative feasibility study to evaluate the TARGET UTI resources, which was running in parallel. The problem driven nature of inquiry and learning led to an overall mixed methods approach in order to understand the effectiveness of the UTI resources and to understand the complexity involved in intervention use, acceptability and implementation (Creswell & Clark, 2017; Morgan, 2013). This pragmatic worldview has enabled me to choose the methods best suited to the research question, and as I am trying to understand the value of the leaflet holistically, a mixed methods approach was best suited for this purpose, although for my doctoral research thesis I will only be reporting on the qualitative component. The quantitative component of the feasibility study is still ongoing as UTI antibiotic data is still being collected ready for analysis to begin in the summer of 2020.

To provide a structure to the enquiry of implementation of the leaflet, the TDF (Cane et al., 2012) was chosen as the determinant and evaluation framework for this study (Nilsen, 2015). Initially, the TDF was used to structure the interview schedules as recommended by its developers,

because it provides an all-encompassing framework to ensure all known behavioural determinants are explored (Atkins et al., 2017). Additionally, I am familiar with this method having used the TDF before to develop interview schedules (Leah Ffion Jones, Emily Cooper, et al., 2018; Leah Ffion Jones, Rebecca Owens, et al., 2018) and have found it to be a useful guide for planning questions. Although this implies a deductive approach, aimed at testing the utility of the TDF, I ensured that there was flexibility within the interview schedules to allow for the generation of new theory and I employed an inductive approach to the first stage of data analysis. ITA was chosen as the method for analysis due to its suitability to applied research in practice (V. Braun & Clarke, 2014), its flexibility to address a range of objectives (Virginia Braun & Clarke, 2006) and the fact that it is not bound to particular epistemologies. Codes and themes were based on the data and developed through an iterative process, using the study objectives as a guide (see section 2.5 in the data analysis section for more detail). This is not an unusual approach (W. T. Tong, Lee, Ng, & Lee, 2017), and arguably provides more flexibility than using the TDF as an analysis framework. Indeed, the developers of the TDF appreciate that difficulties can be faced when using the TDF deductively in analysis, some information may need to be coded separately to the framework for ease of retrieval for descriptive summaries (Atkins et al., 2017).

A further objective of this study was to make intervention recommendations for this context, and as the TDF is inexorably linked to the COM-B and therefore the BCW (Michie et al., 2014), these models were chosen for continuity throughout the research process. The TDF was used again at the end of data analysis by transferring the key findings to the TDF in order to make intervention recommendations using the BCW.

Given the complexity of this topic area, interviews and focus groups were selected as data collection methods because they provide a degree of flexibility and adaptability which is not possible using survey methods (Bauer & Gaskell, 2000). Similarly, interviews and focus groups provide a degree of focus and structure which is lacking in observation and ethnographic methods (Bauer & Gaskell, 2000). The use of both interviews and focus groups is driven by the differences in data that each method provides; interviews provide an insight into an individual's worldview often characterised by providing in-depth data on the topic, whereas focus groups encourage social interaction which stimulates comparisons and reactions to differences and similarities within groups (Bauer & Gaskell, 2000). For example, in this present study it was valuable to explore individual practitioners' experiences using interviews, as well as exploring practice wide behaviours and their interactions using focus groups. Although I reflect on the utility of focus groups with care staff in section 4.9.

By using qualitative interviews and focus groups there is an element of self-selection by participants, which can lead to over representation of enthusiasts with strong opinions on the topic area (Guest, Namey, & Mitchell, 2013). This is a limitation of using qualitative methods in intervention evaluation research as it is important to understand opportunities for improvement as well as the strengths of the intervention. I anticipated and tried to address this limitation by approaching all care homes and general practices initially by letter and then by telephone, and by providing an incentive to participate, thereby increasing the chances of obtaining diverse opinions from those who like the leaflet and those who do not, details of which are described in the data collection section 2.2.5.

2.0.1.2 Establishing rigour in qualitative research

Qualitative research can be approached from a range of different theoretical perspectives, using a range of different methodologies, therefore unlike quantitative methods there is not one unified set of guidance that can be applied to any given piece of qualitative research (Cohen & Crabtree, 2008; R. L. Shaw, Bishop, Horwood, Chilcot, & Arden, 2019). Quality criteria such as the COREQ (Consolidated criteria for reporting qualitative research) checklist (A. Tong, Sainsbury, & Craig, 2007) and the SRQR (Standards for Reporting Qualitative Research) (O'Brien, Harris, Beckman, Reed, & Cook, 2014) provide a useful framework which promotes transparency in the reporting of qualitative research which use interviews and focus groups. These checklists are often used by journals as a way of ensuring rigour and quality in potential publications, however it has been argued that due to the variety of qualitative designs, data collection, analysis and philosophical paradigms it is challenging to summarise all possibilities into one catch all checklist applicable to all qualitative research, (Hannes, Heyvaert, Slegers, Vandenbrande, & Van Nuland, 2015) and that quality criteria should be flexible to allow for these variations. Tracy's Eight ''Big-Tent'' Criteria was developed to remedy the limitations discussed by providing an expansive yet flexible framework for researchers to follow (Tracy, 2010). However, despite many of Tracy's criteria being relevant to the design and methods of this study there are other elements of the criteria which do not seem appropriate, such as the seemingly realist criteria of 'triangulation and crystallisation' which would not be relevant to this as a doctoral research study (Tracy, 2010).

Therefore, the quality criteria outlined below was chosen due to the flexibility and ability to best meet the needs of the research question.

2.0.1.3 Reporting and presentation of findings

The guidance of Elliott, Fisher, and Rennie (R. Elliott, Fischer, & Rennie, 1999) was sought for the reporting and presentation of the findings as this approach is best aligned to a pragmatist

epistemology by stating that qualitative research should be evaluated based on its ability to answer the research question it initially set out to answer (R. Elliott et al., 1999). Furthermore, these guidelines have been designed to incorporate the variety of methods and designs as well as stating that they can be adapted if necessary (R. Elliott et al., 1999). Table shows the six guidelines specific to the reporting of qualitative research outlined by R. Elliott et al. (1999) and where these are addressed within this thesis.

Table 2

Publishability Guidelines Especially Pertinent to Qualitative Research

Publishability Guidelines Especially Pertinent to Qualitative Research	Location within this document
1. Owning one's perspective	• 2.0.2 Researcher context
2. Situating the sample	• 2.2.1 CCG selection and recruitment • 2.2.2 GP practice and care home selection • 4.9 Reflection • 3.1 Sample characteristics • Table 6: Organisation and facility details
3. Grounding in examples	• 3.2 Findings • Table 7: Key findings
4. Providing credibility checks	• 2.5.2 Agreeing a coding consensus • Table 5, section: 2.5.1 Conducting thematic analysis
5. Coherence	• 3.2 Findings • Table 7: Key findings
6. Accomplishing general vs. specific research tasks	• 3.3 Intervention recommendations • Table 8: Intervention recommendations • 4.1 – 4.7 Discussion and implications

2.0.2 Researcher context

Reflection is a key part of conducting any qualitative research (Watt, 2007). Watt suggests that as the researcher is the primary instrument for data collection and analysis it is important for the researcher to acknowledge their own preconceptions, assumptions and behaviour which can influence choice of design, data collection, analysis and interpretation (Watt, 2007). Reflecting on this can consolidate and extend the learning experience (Berger, 2015; Watt, 2007), hence why I have chosen to reflect on my position as a researcher here, and reflect further on data collection later (see section 4.9).

As a researcher, I am predominantly approaching this research question as an outsider (Dwyer & Buckle, 2009). Being an independent, healthy adult, I cannot relate to the experiences of being an older adult in care or providing care for an older adult. I have experienced a UTI but its symptoms and subsequent management were different to that usually experienced by an older adult. Presentation of symptoms can be more generalised in older adults, and diagnosis and treatment is more complex due to higher levels of resistance in this age group (Public Health England, 2018).

Despite being mostly an outsider, I have previously conducted research in this area as a PHE employee. I have conducted interviews and focus groups with care home staff, general practice staff, and older adults and their relatives as part of the needs assessment and leaflet development work. As such, I already have an insight that helped to inform decisions around interview schedules and recruitment, and that may have mitigated any limitations associated with being an outsider and added credibility to my work. Indeed, my position as an insider or an outsider did not cause any difficulties for data collection and was not raised by any participants.

Recommendations from Wigginton and Setchell (2016) highlight the importance of reflection when undertaking research as an outsider, particularly when working with health stigmatised groups. Thus, in order to mitigate any limitations I have reflected on my aims, values and assumptions throughout the research process, including challenging negative representations of my participant populations (Wigginton & Setchell, 2016). Explicit verbal disclosure was not necessary as all participants knew from the information form (provided prior to recruitment) that I am a female PHE employee and a trainee health psychologist (Wigginton & Setchell, 2016).

2.1 Ethical approval and considerations

The NHS Health Research Authority (HRA) confirmed that this study met the criteria for a service evaluation and thus did not require NHS ethical approvals, see Appendix 4 for confirmation. However, as this work was conducted as part of my Professional Doctorate in Health Psychology it has been reviewed and approved by the University of the West of England ethics committee (UWE REC REF No: HAS.18.10.042 Jones).

All participants who participated in the study are anonymous and any identifiable information was removed from transcripts.

Talk of UTIs could be considered a personal topic therefore all residents were offered interviews rather than focus groups, in order to prevent potential embarrassment and to facilitate engagement with the study. All other participant groups were offered interviews or focus groups but were reminded to treat everything discussed in any focus group as confidential.

Only care homes with Care Quality Commission (CQC) ratings of 'requires improvements' or above were contacted regarding this study, in line with ENRICH guidelines (ENRICH - Enabling Research in Care Homes, 2017). This was to ensure that those care homes rated 'inadequate', and therefore at risk, were not distracted from providing and improving care.

Individuals with limited capacity (e.g. as a result of dementia, or stroke) were not eligible to take part in this study as they were unable to provide informed consent.

2.2 Data collection

2.2.1 Recruitment and sampling strategy

The recruitment and sampling strategy protocol aimed to gather a mix of opinions and experiences from each participant group. Participants were randomly invited from two regions in the UK selected due to their different implementation strategies, antibiotic prescribing rates and population demographics, as outlined below.

A number of CCG stakeholders involved during the leaflet development phase expressed an interest in implementing the PHE UTI resources within their regions. Within these regions, I selected two CCGs based on their history of antibiotic prescribing and the area's demographics, strategies for implementation of the leaflet and region size. These were Gloucestershire CCG and the East Kent CCGs.

The reason for choosing two areas with differing implementation strategies was to obtain a range of attitudes and opinions reflected by the differing perception of priority within each region. The very fact that both regions were committed to the leaflet implementation meant that both regional stakeholders felt strongly about the topic of UTIs.

In order to avoid recruiting only AMR enthusiasts with good antibiotic prescribing levels and therefore good practice, regions were also selected based on their range of antibiotic consumption using PHE antibiotic surveillance data (Public Health England). Region size was also felt to be important as physical proximity to services can impact on implementation, therefore Gloucestershire was chosen for its large size and the East Kent CCGs for their relatively smaller sizes (Krein et al., 2017). Regional demographic variation was also taken into account to allow for a variety of attitudes from the older adult participant groups as interactions and understanding of health literature differs among different demographic groups, as discussed in the introduction (Public Health England & UCL Institute of Health Equity, 2015).

2.2.1.1 Gloucestershire Clinical Commissioning Group

Gloucestershire CCGs' plan for implementing the UTI leaflet included: posting copies of the leaflet to all general practices across the county; workshops and educational training on the latest UTI guidance offered to all care homes and GP practices; a complementary hydration campaign to prevent UTIs in care homes, and promotion using branded merchandise and a touring marketing bus. In addition, Gloucestershire CCG have departed from PHE guidance by requesting that all suspected UTI cases, regardless of age, should have urinalysis testing so that the Gloucestershire Trust laboratory can monitor resistance rates in the community; PHE guidelines only recommend urinalysis for over 65 year olds with suspected UTIs (Public Health England, 2018).

According to PHE antibiotic prescribing surveillance data (Public Health England), Gloucestershire CCG are in the second quintile for least amount of antibiotics prescribed overall compared to all other CCGs in England. Indices of deprivation show Gloucestershire CCG as being in the second to least deprived quintile in England, however within Gloucestershire there is a wide disparity of deprivation between Gloucester Central which is an area high in deprivation compared to areas in Cheltenham and the Cotswolds, which have low levels of deprivation (Public Health England).

2.2.1.2 East Kent Clinical Commissioning Groups

South Kent CCG, Canterbury and Coastal CCG, Thanet CCG and Ashford CCG have established a joint committee called East Kent CCG. The East Kent CCG disseminated the leaflet to all practices and care homes in the four regions electronically or in hard copy, depending on each region's preference. A unique facet to the East Kent CCGs is their use of Links practitioners who act as a conduit for information from the Head of Infection Prevention and Control (IPC) to primary care facilities. All Links practitioners are required to attend IPC meetings and are given protected time for their specific IPC duties, including staff training and ensuring all staff have up to date IPC knowledge. Links practitioners were established in every care home and general practice in East Kent, who were then offered training on the latest UTI guidance with the view of disseminating in their respective settings.

South Kent CCG and Canterbury and Coastal CCG are in the third quintile for antibiotic prescribing whereas Thanet CCG and Ashford CCG are in the fifth quintile for the most antibiotics prescribed in 2018 (Public Health England). According to the national indices of deprivation, Canterbury and Coastal CCG and Ashford CCG are both in the second to least deprived quintile, and South Kent CCG is in quintile three. Thanet CCG is in the most deprived quintile (Public Health England).

2.2.2 GP practice and care home selection

A list of all care homes servicing older adults and GP practices were obtained from contacts at each CCG. In accordance with the Enabling Research In Care Homes (ENRICH) guidelines, care homes considered 'inadequate' in the CQC inspection rating were not selected for this study, as this would likely distract from other areas of care (ENRICH - Enabling Research in Care Homes, 2017).

The list of care homes and general practices were stratified based on area type (rural/urban) using the 2011 Rural-Urban Classification of Local Authority Districts in England (Department for Environment Food & Rural Affairs, 2014). Geographical location and proximity of health facilities has been shown to influence the implementation of health interventions in care homes (Krein et al., 2017), therefore stratification based on rural and urban locations ensured recruitment of participants from a range of geographical areas in each region. I chose not to account for other factors such as socioeconomic status and UTI prevalence as these will vary within each region and across facilities.

After the CCGs had implemented the leaflet in each region for a minimum of four months, all care homes and general practices in each region were contacted with an introductory letter describing the study and inviting them to participate. Based on my previous research (Leah Ffion Jones, Meredith K. D. Hawking, et al., 2018) and NHS guidelines on evaluating interventions (NHS Employers, 2014), four months was considered sufficient time for the leaflet to be implemented and used.

Around two weeks following receipt of the letter, care homes and general practices were contacted by telephone to establish their interest in participating, see Figure 3. Each stratified list was randomised using the RAND function in Microsoft Excel to provide the random order in which to telephone each facility. Two weeks provided sufficient time for care homes and general practices to read, consider or discuss the letter within their respective teams. Stratification by rural/urban also allowed for a variance in the participants demographics.

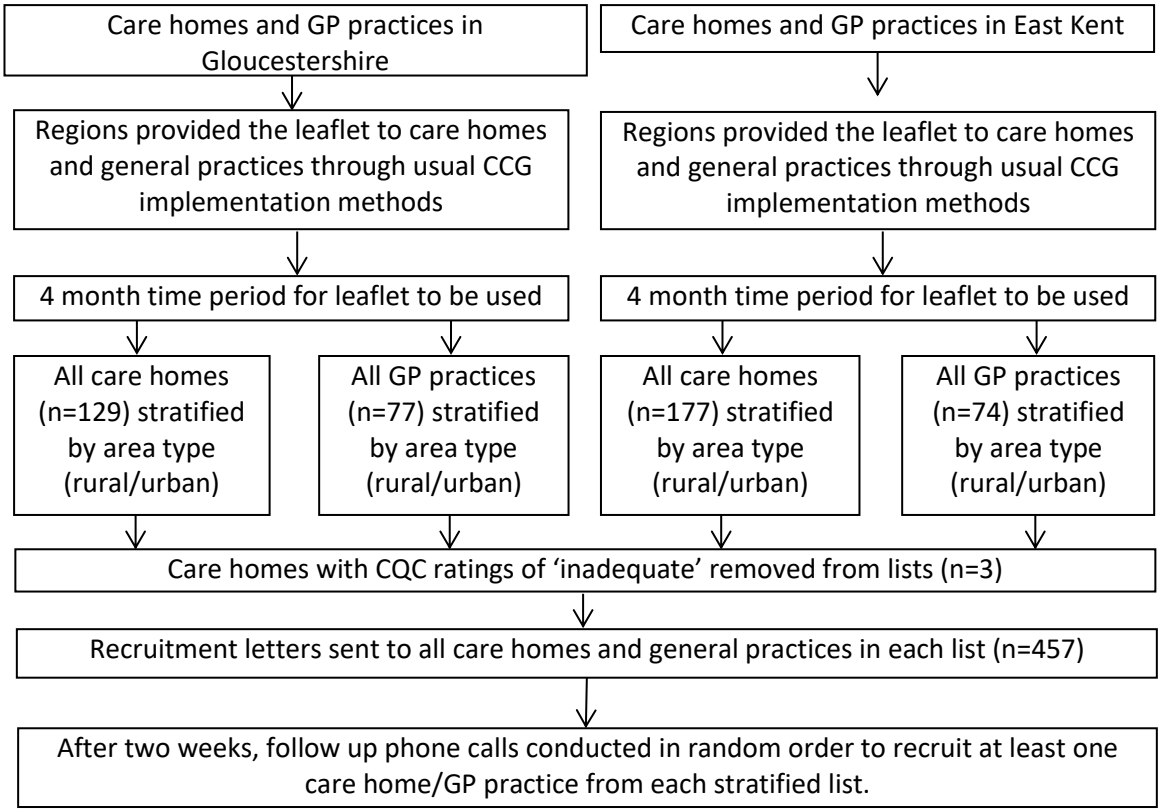


Figure 3: Care home and GP practice selection flow chart

My use of a probabilistic sampling method i.e. randomisation and stratification, is unusual but not uncommon in qualitative research (Guest et al., 2013). As previously discussed, the nature of this topic is complex and a wide variety of opinions and experiences were sought to explore these topics thoroughly. By using randomisation and stratification in this way, the transferability of the findings was enhanced, which is important here as this study complements a feasibility RCT and will inform the design of the final RCT, therefore a wide range of opinions leading to transferable findings is desirable. It is important to try and obtain a wide range of opinions and experiences of the leaflet to not only understand the variety of use and implementation but to also guide further study design (Guest et al., 2013). Whilst I cannot guarantee that randomisation and stratification ensured a wide range opinions were collected, along with providing incentives, it does increase the chance that a non-biased sample was used.

2.2.3 Participant recruitment

Managers or the point of contact (e.g. Care home clinical lead or GP partner) were asked, in the letter and follow up phone call or email, to disseminate the study information in order to recruit staff and older adults for interviews and focus groups.

Managers/Contacts were specifically requested to approach older adults with experience of UTI, as their experiences of managing and preventing UTIs and their use of the leaflet are particularly pertinent. However, they were asked not to invite older adults with limited capacity for interview (e.g. as a result of dementia or stroke), as they would be unable to provide informed consent. I decided that care home managers/clinical leads and primary care clinicians were best placed to identify potential participants with sufficient capacity to participate in discussions and provide informed consent, due to their familiarity with their patients and residents. Only older adults that they deemed as having sufficient capacity were approached, no older adults were approached to take part in this study if they were deemed as lacking in capacity by the managers or clinicians.

For care homes, I requested that potential older adult participants were provided with the study information form in order to make an informed decision regarding their participation. For willing general practices, I provided the surgery with a number of information forms for either clinicians or receptionists to hand out to potential older adult participants, or leave in the waiting room.

Participating care homes and general practices were given advice on usage or implementation by the CCG but not as part of this study. This was to understand implementation and usage in a real-world setting. As such, even if participants were not aware of the leaflet or had chosen not to use it they were still eligible for recruitment, as it is valuable to understand their current management of UTIs, their reasons for not having seen/used the leaflet, and their assessment of the leaflet's value. All participants were sent the leaflet alongside the study information form so that those who had not seen it before could reflect on the content prior to the interview.

I identified stakeholders using known work contacts through Public Health England and previous engagement with professional societies. I set out to recruit national representatives of primary care clinicians and care staff to discuss their views on implementation from a national perspective, as well as commissioners from both regions to discuss the overview of implementation and strategy in their regions and their facilitators and barriers.

2.2.4 Adaptation to the recruitment strategy

General practices proved to be a difficult group to recruit. Practice managers reported lack of time on behalf of their clinicians as the reason for non-participation, often declining the opportunity to circulate the study information to the practice clinicians. In order to mitigate this issue, I adapted my recruitment strategy to recruit more general practice staff via educational sessions delivered in Gloucestershire as part of a collaboration between PHE, Gloucestershire CCG and Gloucestershire NHS Trust. This provided an opportunity to reach clinicians directly. As part of the evaluation forms for the sessions, clinicians provided their contact details and could tick an

optional box to receive additional information about related research. Nine clinicians gave their consent to be contacted. I emailed study information to all nine clinicians and conducted one interview with a GP as a result.

2.2.5 Payments to participants

To reward stakeholders, care home and general practice staff for engaging in research in addition to their usual work commitments, participants were given £20 in high street vouchers. Care homes and general practices were also offered certificates of participation. Past research experience (L.F. Jones et al., 2020; Leah Ffion Jones, Meredith K. D. Hawking, et al., 2018) has indicated that some members of staff and managers value certificates of participation as they can use this on their CV, contribute towards individual CPD and demonstrate active engagement in health research.

In my experience of conducting the leaflet development work, I found that care home residents were unable to leave their facility and were therefore unable to use high street vouchers. It was apparent that the voucher incentive was not valued by the older adults and did not influence their willingness to participate, therefore voucher incentives were not offered to older adults as part of this study.

2.3 Interview schedules

There were four interviews schedules in total, see Appendix 5; one for general practice staff, one for care home staff, one for older adult interviews, and one for stakeholders. All interview schedules were based on the Theoretical Domains Framework (Cane et al., 2012) and informed by the needs assessment (see section 1.0.6) (L.F. Jones et al., 2020) that initially went in to developing the leaflet (e.g. focus groups and interviews with carers, general practice staff and older adults, and literature reviews).

The interview schedules were developed with assistance from a patient representative (see 2.3.1) and piloted with one to two people from each participant group. No major amendments were made to the schedules following piloting, therefore pilot data is included in the results. The schedules were semi-structured to allow for discussions to be led by participants' narratives and for further exploration of important topics (Gill, Stewart, Treasure, & Chadwick, 2008). Questions were used flexibly and were modified iteratively based on the data collection, for example, as I established that delirium provided some difficulty in diagnosing, I adapted my line of enquiry to include a focus specifically on delirium and how those patients were managed. Probes such as "Can you tell me more about….; what do you mean when you say…..; explain your thoughts on…."

were used to elicit further information and to clarify interviewee understanding. I have previous experience of conducting interviews and focus groups (Leah Ffion Jones, Emily Cooper, et al., 2018; Leah Ffion Jones, Meredith K. D. Hawking, et al., 2018; Leah Ffion Jones, Rebecca Owens, et al., 2018), and have received training from the University of Bristol on the Introduction to Qualitative Methods short course in 2015.

Interviews and focus groups with general practice staff and care home staff covered their usage of the leaflet, barriers and facilitators to usage and any suggestions for improvement. Interviews with older adults covered their experiences of having a UTI, their attitudes and opinions of receiving the leaflet, their experiences of disseminating it, thoughts on the content and its perceived usefulness. Interviews with key stakeholders covered any organisational barriers or facilitators to implementation.

The older adult interview schedule was shared with care home managers alongside the introduction letter to ensure they were aware of the questions being asked to their residents, and to help them accurately identify older adults with sufficient capacity and understanding to participate. However, managers were asked to keep schedules confidential in order to prevent potential priming of the older adults (Knox & Burkard, 2009). Evidence suggests that older adults are more likely to display social desirability bias compared to younger adults (Dijkstra, Smit, & Comijs, 2001) and this strategy was also recommended by the patient representative, detailed below.

2.3.1 Patient and public involvement

During the development phase of the leaflet, a person-based approach was used throughout, whereby the leaflet was grounded in a "profound understanding of the perspective and psychosocial context" (Yardley, Morrison, et al., 2015)(p2.) of the leaflet's audience i.e. older adults, carers and clinicians, gained through iterative in-depth qualitative interviews and focus groups (L.F. Jones et al., 2020). Thirty-one care staff, three residents, six relatives, 57 GP staff and 19 members of the public contributed to qualitative interviews and focus groups to understand their views and experiences of UTIs and their opinions of the leaflet and how it should be adapted and improved. A further 24 experts in AMS, UTIs, older adult care, behavioural science, implementation, GPs and patient representatives took part in four workshops across the data collection period, in order to consolidate the changes made to the leaflet and agree a consensus on the content and formatting. Changes to the leaflet were made iteratively after each focus group, interview and workshop. For example, illustrations were included, information was grouped into coloured boxes and the font was increased to facilitate reading, additional

information relevant to older adults was also included such as information around other causes of confusion.

To ensure that the questions were appropriate and understandable, during the development of the interview schedules advice was sought from a retired older adult patient representative familiar to UTI work within PHE, but not a health professional. The patient representative felt that the questions were straight forward and simple. They were also asked if the schedule should be provided beforehand to give older adults an opportunity to think about their answers before the interview. They suggested this would not be necessary due to the simplicity of the questions and doing so may cause participants to rehearse or consider providing answers which they believe are socially desirable to the researcher (Dijkstra et al., 2001; Knox & Burkard, 2009).

2.3.2 Incorporating findings from the Theoretical Domains Framework and needs assessment when designing interview schedules

As well as including questions directly relating to use and implementation of the leaflet, the interview schedules also contained questions deductively derived from the findings of the TDF and needs assessment that informed the leaflet development (see section 1.0.6).

The interview schedules were based on the TDF (Cane et al., 2012) to ensure that all behavioural determinants were explored within the schedules (e.g. their knowledge, skills, optimism etc., see Table 3). Each question corresponded to one of the 14 behavioural domains, and each domain is used at least once in the schedules. Use of the TDF allowed for application of the findings to the BCW (Michie et al., 2014) and BCTs (Michie et al., 2013) for making further intervention recommendations for this context.

Table 3

The 14 domains of the Theoretical Domains Framework

	Domain
1	Knowledge
2	Skills
3	Beliefs about capabilities
4	Environmental context and resources
5	Professional role and identity
6	Beliefs about consequences
7	Optimism
8	Emotion
9	Memory, attention and decision processes
10	Goals
11	Social influence

12 Intentions
13 Behavioural regulation
14 Reinforcement

Despite using the TDF to inform and structure the interview schedules, they were used flexibly to guide discussions and allow for novel but relevant topics to be discussed. Participants were encouraged to speak freely and openly regardless of relevancy to the TDF domains.

In addition to selecting questions based on the TDF, questions exploring the areas of relevance identified during the needs assessment (shown in Table 4) were also included.

Table 4

Findings from the needs assessment to develop the leaflet

Finding
1. Care staff lack knowledge of UTIs & asymptomatic bacteriuria
2. Lack of awareness for care staff of limitations of urine dipsticks in the diagnosis of UTIs in older people
3. Care staff identify initial signs of infection
4. Care staff feel pressure from GPs to use urine dipsticks and GPs believe it will be difficult to change the culture of using urine dipsticks
5. It is difficult to obtain urine samples from some older adult residents
6. Not enough available information for carers on prevention of UTI
7. Care homes have to chase urinalysis results

Questions related to these areas were included in the analysis to increase understanding of the context in which the leaflet was/was not being used, any changes to behaviour as a result, and to assess whether the content of the leaflet was acceptable and in line with participant's beliefs and practices around: the use of urine dipsticks to aid diagnostic decision-making; roles and responsibilities in diagnosis and management, obtaining urine samples to aid treatment decisions; the process of urinalysis and their knowledge of asymptomatic bacteriuria.

2.4 Conducting the interviews and focus groups

General practice and care home staff were offered interviews or focus groups depending on their preference and what was practical for them, and these were conducted face to face in a quiet room provided by the care home or general practice; usually a staff room or an unused consultation room. Older adults were only offered interviews, rather than focus groups, as discussing experiences of UTIs could be considered personal and therefore privacy to discuss these topics freely was considered important.

Before the interviews and focus groups began, I explained the information sheet, gave participants the opportunity to ask questions. As well as asking them to sign a consent form,

participants were asked to verbally confirm for the audio recording that they were happy to take part.

Individual interviews lasted between 13 and 47 minutes, and focus groups lasted for 24 – 57 minutes. After each interview or focus group, I made reflective field notes on impressions, including non-verbal data, and any new emerging topics to explore in future interviews and focus groups.

The interviews and focus groups were audio recorded and transcripts were anonymised by removing names and providing participants with a personal identification number (PIN). Personally identifiable information such as consent forms and audio files are stored on secure Public Health England servers according to the EU General Data Protection Regulation (European Parliament, 2016) and hard copies are kept in a locked cabinet.

The audio recordings were transcribed verbatim by an external transcribing company with Government clearance. Names and personal information mentioned in the transcripts were removed or anonymised to ensure confidentiality of all participants. Participants were given the opportunity to withdraw their data for up to 24 days after data collection, but no participants requested this.

2.5 Data analysis

All focus groups and interviews were analysed together in Nvivo 11 (QSR International Pty Ltd., 2012) using Inductive Thematic Analysis (ITA). Codes were generated using a semantic approach (Virginia Braun & Clarke, 2006), from the data line by line, codes were then grouped iteratively into higher and lower order themes (see details below in section 3.2). Throughout, data analysis was driven by the study objectives and the data itself, analysis was not guided by the TDF at this stage, see section 2.5.1 for full details. An inductive approach was used as the nature of induction is more suited to theory generation and discovery (Morgan, 2013), and means the data is strongly linked to the themes identified (Virginia Braun & Clarke, 2006). This was conducted alongside data collection in order to modify the interview schedules iteratively and ensure important topics were explored thoroughly. For example, when it became apparent that 'emotion' was not an important domain for care staff and general practice staff I ceased asking those questions.

An arguable criticism of using a deductive approach to analysis with the TDF is that not all data can easily fit one or more of the domains and therefore certain codes may need to be coded separately to the TDF. The developers of the TDF state that it is perfectly appropriate to code data outside of the TDF if necessary, but warn that it is likely that the data does not directly relate to

the topics intended to be explored (Atkins et al., 2017). However, I would argue from my experience here and with other similar studies (Leah Ffion Jones, Rebecca Owens, et al., 2018) that codes outside of the TDF can provide important contextual information. ITA was chosen for this study to allow for flexibility in the analysis and generation of themes, without the restriction of the TDF domains. Indeed, other studies using the TDF have also used this approach (W. T. Tong et al., 2017).

Once data collection and ITA was complete, I adopted a deductive approach by placing key themes from the inductive framework into the corresponding domains of the TDF to identify important behavioural determinants to apply to the COM-B and BCW (Virginia Braun & Clarke, 2006; Gale, Heath, Cameron, Rashid, & Redwood, 2013). Some findings did not fit the domains of the TDF and therefore these findings are reported as part of the ITA in section 3.2. I have successfully used this approach before in a similar exploratory study in the community pharmacy setting (Leah Ffion Jones, Rebecca Owens, et al., 2018). This process is illustrated in Table 7 of the results section.

Using the matrices in the Behaviour Change Wheel book (Michie et al., 2014), key behavioural findings were mapped from the TDF on to the BCW. This was done by selecting the key findings and their corresponding TDF domains and looking up which intervention categories of the BCW were relevant for the given domain e.g. the domain 'knowledge' can be influenced by education, training and enablement related interventions. Using the selected intervention categories I then explored their corresponding BCTs (Michie et al., 2013) in order to select relevant and specific intervention techniques to inform recommendations for novel interventions. This process is represented in Table 8 (section 3.2) in the results section.

2.5.1 Conducting thematic analysis

Braun and Clarke's guidelines for conducting ITA were adopted to maximise rigour within the analysis and increase trustworthiness of the findings. Table five shows the six phases of thematic analysis outlined by Braun and Clarke (Virginia Braun & Clarke, 2006) alongside the phased process used in this study.

Table 5

Phases of inductive thematic analysis as described by Braun and Clarke (Virginia Braun & Clarke, 2006) and descriptions of the process used in this study

Phase of analysis	Description of process for this study

1.	**Familiarising yourself with your data**	• I conducted all of the interviews and focus groups • Immediately following each interview or focus group I noted down initial thoughts and comments • I listened to the audio files against the transcripts to check for accuracy • I listened to the audio files again before conducting analysis • I read and re-read the transcripts
2.	**Generating initial codes**	• Coding was conducted manually using QSR Nvivo 11 • Each transcript was coded from start to finish • Coding was data driven (inductive) • 10% of transcripts were double coded by a second researcher which informed the coding process
3.	**Searching for themes**	• All codes were grouped in QSR Nvivo 11 into higher level themes and sub-themes ○ E.g. Codes 'They helped monitor wellbeing', 'They led to UTI over diagnosis', 'nurses came back and told us to stop' were grouped under the higher-level theme of 'We stopped dipsticking recently' • No codes were discarded but some were not grouped due to having only a peripheral relevance to the topic • Discussions with the double coder around themes informed some of the higher-level themes such as for urine dipstick topics
4.	**Reviewing themes**	• Themes were compared against the raw data extracts to refine or re-name themes • A thematic map was created manually in QSR Nvivo 11 to represent the full data set • The thematic map was discussed with the double coder to ensure all data was represented in the thematic map
5.	**Defining and naming themes**	• Discussions with the double coder around themes informed some of the higher-level themes such as for urine dipstick topics • The data was re-visited and cross checked against the thematic groups • Themes are defined in section 3.2 and Table 7 alongside corresponding raw data extracts
6.	**Producing the report**	• All key themes are represented in section 3.2 and Table 7 • Choosing data extracts involved revisiting the data and cross checking with the themes and adjusting when necessary

2.5.2 Agreeing a coding consensus

A double coder coded 10% (3) of the transcripts. The double coder has a background in biological sciences and has not conducted any research in the care home setting prior to this work. This

allowed for an individual with a different perspective to view the data and potentially extract different codes and different themes.

The double coder used QSR Nvivo 11 software (QSR International Pty Ltd., 2012). We met to discuss our coding of the same transcripts and potentially important higher-level themes. This process helped me identify a small number of low level codes which I had originally missed, and we discussed the issues raised around use of urine dipsticks and the difficulties reported in implementing the leaflet.

This was not an exercise in establishing reliability or consistency which is sometimes used in larger studies with multiple researchers (McAlister et al., 2017), here the purpose was to ensure quality and rigour in the findings by facilitating the iterative nature of the data analysis and inform recoding and refinement of themes (V. Elliott, 2018).

3.0 Results

3.1 Sample characteristics

Ninety-three participants took part in either focus groups or interviews from March to September 2019, from a range of urban and rural locations across Gloucestershire and East Kent, including a range of stakeholders from national and local health organisations. For details of the participating facilities and organisations including their use of the leaflet see Table 6.

Table 6

Organisation and facility use of leaflet and location details

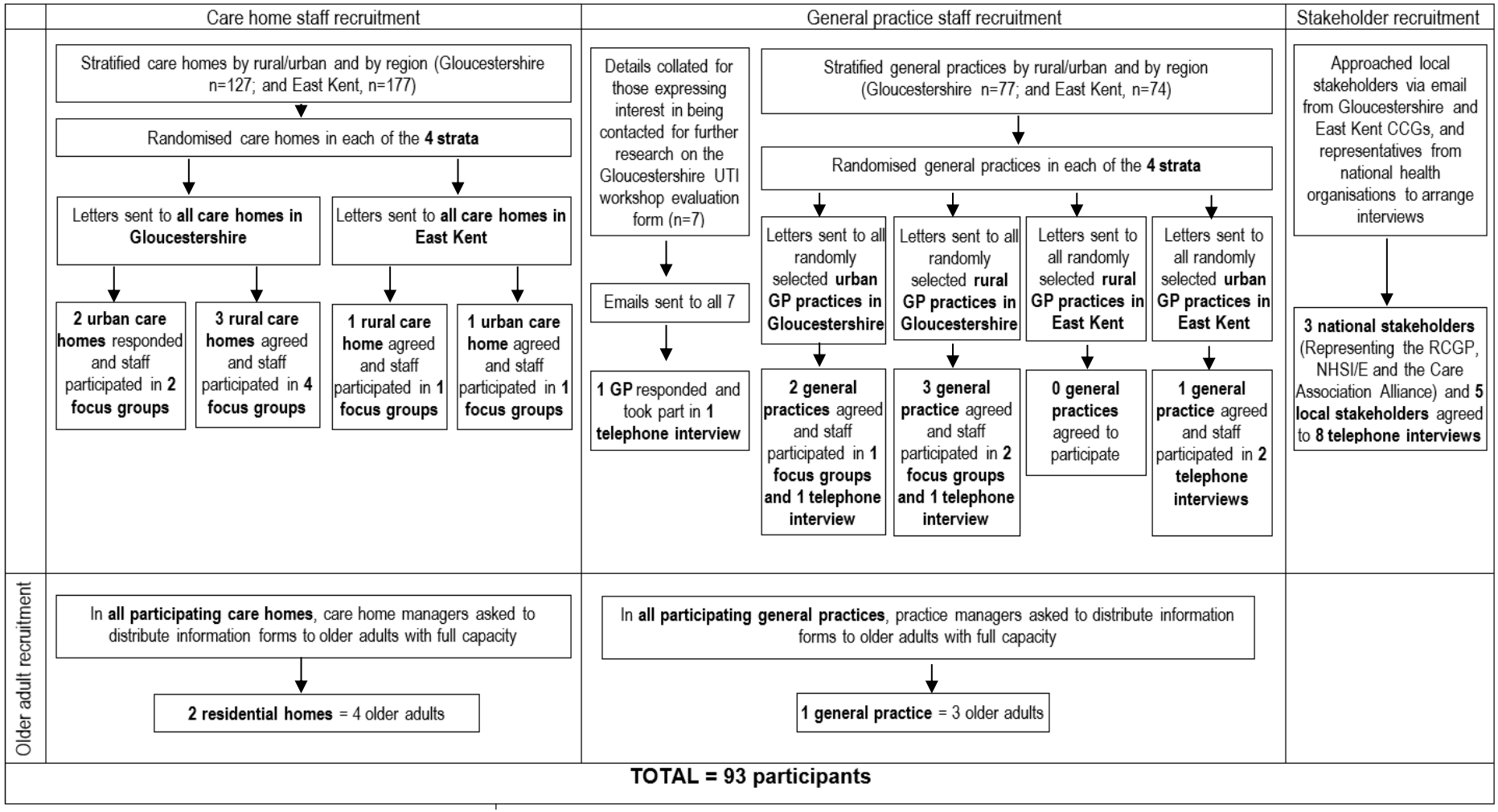
Identifier	Location	Use of leaflet	Rural/ urban	Interview/focus group	Number of participants
Care home staff 1	Gloucestershire	Not seen, not used	Urban	Focus group	6
Care home staff 2	Gloucestershire	Not seen, not used	Urban	Focus group	5
Care home staff 3	Gloucestershire	Seen, not used	Rural	Focus group	7
Care home staff 4	Gloucestershire	Not seen, not used	Rural	Focus group	5
Care home staff 5	East Kent	Not seen, not used	Urban	Focus group	7
Care home staff 6	East Kent	Not seen, not used	Rural	Focus group	3
Care home staff 7	Gloucestershire	Used	Rural	2x Focus groups	20
General practice staff 1	Gloucestershire	Seen, not used	Rural	Focus group	10
General practice staff 2	Gloucestershire	Used in reception	Urban	Focus group	5
General practice staff 3	Gloucestershire	Used	Rural	Focus group	5
Nurse practitioner 1	East Kent	Not seen, not used	Urban	Telephone interview	1
Nurse practitioner 2	East Kent	Used	Urban	Telephone interview	1
Nurse practitioner 3	Gloucestershire	Used	Rural	Telephone interview	1
GP 1	Gloucestershire	Used	Urban	Telephone interview	1
GP 2	Gloucestershire	Used	Urban	Telephone interview	1

Care home residents 1	Gloucestershire	Not seen	Urban	Focus group	3
Care home resident 2	Gloucestershire	Not seen	Rural	Face to face interview	1
Older adult 1	East Kent	Used	NA	Telephone interview	1
Older adult 2	East Kent	Used	NA	Telephone interview	1
Older adult 3	East Kent	Used	NA	Telephone interview	1
Stakeholder 1	Care Providers Association / Gloucestershire	Not seen	-	Telephone interview	1
Stakeholder 2	NHSI and commissioner	Implemented[4]	-	Telephone interview	1
Stakeholder 3	Commissioner	Implemented	-	Telephone interview	1
Stakeholder 4	Commissioner	Implemented	-	Telephone interview	1
Stakeholder 5	National, pharmacy	Seen, not used	-	Telephone interview	1
Stakeholder 6	Commissioner	Implemented	-	Telephone interview	1
Stakeholder 7	National, RCGP	Seen, not used	-	Telephone interview	1
Stakeholder 8	Commissioner	Implemented	-	Telephone interview	1
				TOTAL	93

Two care homes and one GP responded to the initial letter agreeing to participate, whereas all other facilities received follow up telephone calls in order to recruit participants. One GP was recruited as they expressed an interest in research participation, full details are described in 2.2.4 A summary of the recruitment strategy and corresponding recruitment Figures can be seen in Figure 4.

[4] As all stakeholders were not in a position to use the leaflet personally, the term 'implemented' has been used to demonstrate that the leaflet had been implemented within their organisation or work settings i.e. a commissioner who had promoted and disseminated the leaflet within their CCG.

Figure 4: Final recruitment strategy and Figures



3.1.1 Care home staff participants

Forty-three care home staff participated in six focus groups from five care facilities across Gloucestershire. Two facilities were in urban town centre locations, and three facilities were located in rural countryside locations, two of which provided nursing care, one of which was a specialist dementia facility. Ten care home staff participated in two focus groups in East Kent, one in an urban town centre location and the other in a rural countryside location, both provided residential care. Five care homes had CQC rating of 'good', and two care homes had a rating of 'requires improvement', none were excluded based on their CQC rating.

Of the participating 53 care home staff, three were registered nurses, two were administration/reception staff, and the remaining 48 participants were carers of varying levels.

3.1.2 General practice staff participants

Twenty-three general practice staff from six Gloucestershire practices participated in three focus groups from two rural practices and one urban practice, and three telephone interviews from two urban practices and one rural practice. Two participants from an urban general practice in East Kent took part in two telephone interviews.

3.1.3 Older adult participants

Seven older adults took part: four older adults from Gloucestershire care facilities participated in one focus group and one face to face interview. Three older adults living independently in the East Kent community participated in three telephone interviews.

3.1.4 Stakeholder participants

Of the eight participating stakeholders, two represented national organisations such as the Royal College of General Practitioners and NHS Improvement, one was an academic pharmacist, three represented the East Kent CCGs, one represented Gloucestershire CCG and one represented the Care Providers Associated from a national and a Gloucestershire perspective.

3.2 Findings

They key findings are described in this section, categorised into the three higher level themes of: use and implementation of UTI resources including the leaflet, identifying/diagnosing a UTI and management/treatment of UTIs in older adults. These three higher level themes contain subthemes for specific categories relating to the higher-level themes.

3.2.1 Theme 1: Use and implementation of the older adult UTI leaflet

This theme features key findings directly related use of the older adult UTI leaflet and how the leaflet was implemented in both regions, highlighting the variance in use, suggestions for improvements, and barriers to implementation.

3.2.1.1 Subtheme: A useful infection prevention and control tool

All care staff and most general practice staff believed that the leaflet was a useful tool to help staff and relatives identify and manage UTIs. The urine colour chart was the most popular section for staff as it provided a useful tool for discussion.

"The leaflet is really good. I think it's very clear for anybody to understand it" – care home staff 1, focus group

"I quite like that because actually I talk to patients about urine colour but actually to have a leaflet that backs that up is really quite helpful." – nurse practitioner 3, telephone interview

Those clinicians using the leaflet believed that it reinforced the information they gave to patients:

"I find them helpful if I'm having a discussion with a patient and they don't, not really buying into what I'm saying" – general practice staff 3, focus group

However, the majority of care staff reported never having seen the leaflet prior to the focus group. Those care staff who were familiar with the leaflet tended to use it as their own guide for identifying and managing UTIs, some carried the leaflet in their pockets and some had it attached to their clipboards.

"Carer 1 It's a guideline.
Carer 2 Isn't it.
Carer 3 Yeah, it is a guideline, yeah." – care home staff 5, focus group

Some care staff valued the leaflet because they felt that having an official document to give to residents reinforced the messages they were already giving verbally, and increased the chances of adherence. The leaflet was also educational for many care staff as it provided new information.

"… he was a difficult one to get to drink, wasn't he…Seeing it in writing, it might have, seeing it in writing…Maybe if he saw something like this it might have helped." – care home staff 1, focus group

"I always thought cranberry juice was, was a good one" – care home staff 5, focus group

A pharmacy stakeholder was confident that the leaflet would be appropriate for community pharmacy settings for both pharmacists and pharmacy staff.

"I can see the role for the leaflet without a question of doubt…I think this could help both in a sense. Because the pharmacy staff, when I say pharmacist I mean the pharmacy staff, they could be the first person that they see because it could help them to refer" – stakeholder 5, telephone interview

A couple of older adults had kept the leaflet in their home and shared it with their friends and family who they felt would benefit from the information. Only one care home resident said that they would not use the leaflet as they prefer to rely on their carers for support.

"I've photocopied yours, I hope I've done the right thing, just to give to my daughters because this sort of information is invaluable." – older adult 1, telephone interview

All older adults and some general practice staff believed that the leaflet would benefit everyone in the identification and management of UTIs, including young adults as they believed the information would be relevant to younger groups too.

"I mean it's for, a lot of young people get it as well. So why is it targeted to older people?" – older adult 2, telephone interview

Commissioners reported that they liked the leaflet because the messages within it linked well to other topic areas within infection prevention and control and therefore could be used across training topics. However, stakeholders noted that there was no quantifiable way of monitoring use of the leaflet in their region.

"We share the information, we emphasise its importance, its significance on patient care, but no, we don't have any way of monitoring that." – stakeholder 4, telephone interview

3.2.1.2 Subtheme: Not appropriate for all older adults

Most care staff believed that the leaflet was more appropriate for the education of care staff and relatives of residents rather than as a resident-facing resource.

"Relatives, care staff, people that are going to be around here but not necessarily vulnerable to it. So that they can see the symptoms of their friends or family if they're getting them" care home staff 7, focus group

Their concern was that residents would not understand the leaflet, or the leaflet would be too overwhelming for them. One practitioner stated that they would not use the leaflet with those over 85 years old in the community, as it could be too much for them.

"Sometimes it just feels like they have so much going on and there's so many things that worry them that actually it feels like you're then giving them something else" nurse practitioner 3, telephone interview

Furthermore, older adults did not like the title on the leaflet 'older adults' as they did not associate themselves with this label.

"I must admit, the only thing I didn't like about it was the wording at the top which says it's a leaflet for older adults and carers" older adult 2, telephone interview

3.2.1.3 Subtheme: Intentions to use the leaflet are contingent on its provision

All general practice staff expressed the intention to use the leaflet either by printing it out in hard copy or by electronically emailing or texting it to patients, a few suggested providing it at reception to give to those bringing in unrequested urine samples. General practice staff would like the leaflet to be made available electronically and in hard copy to suit their preferences for dissemination, as some prefer texting or emailing leaflets whereas others prefer providing hard copies. No one reported lack of printing facilities as a barrier.

"So, bits of paper get lost in piles but if you've got it electronically, so you can print it off or text it to them, it's easier." – GP 2, telephone interview

Although some clinicians were using the leaflet with patients, not all clinicians within a practice were aware of the leaflet or indeed using it.

"We were aware of it…so as a practice, I'll say this much…it's not being used as a whole practice." – nurse practitioner 3, telephone interview

A national stakeholder recommended dissemination of the leaflet via the Care Association Alliance as they have national coverage and can distribute the leaflet directly into care homes depending on the formatting preference for the region.

"if you came to us and said, how do we disseminate this, we'd be saying…in my area give me 2,000 leaflets, I'll make sure they get out to all of those people that need to have it. Another area will say, give me the electronic version I'll make sure it goes out. Other areas…might say, let's include it as part of a workshop, but we'd be targeting those on the ground. Yeah, I'd certainly recommend that kind of approach for the, getting things out at a local level." Stakeholder 1, telephone interview

Another national stakeholder recommended raising awareness of the leaflet to GPs via a short screencast (a short educational online video) by the Royal College of General Practitioners (RCGP) as it is a short and easily accessible resource for GPs.

"One of my favourite ones is a screencast…RCGP, 'five minutes to change your practice'…it's a screencast…It's all the top tips, things like this…so you can make it really, really accessible… on your smartphone or in your surgery or on the train or wherever …It's short, to the point…I could very easily imagine a very quick, what's the current thinking about urinary tract infection? It would

include about diagnosis, it would include about treatment, it might include, for example, when you would do follow up, things like that…" – stakeholder 7, telephone interview

3.2.1.4 Subtheme: Use alongside diagnostic tools

Use of the leaflet by general practice staff tended to be complemented by use of the PHE diagnostic flow chart or their own locally developed tool. Some general practice staff were already using the PHE diagnostic tools for UTIs, and two general practices had developed their own guidelines or templates for all staff to use prior to publication of the PHE tools.

"*we thought it might be something that would be useful to look at and get everybody doing the same things and hopefully following the guidelines." – general practice staff 1, focus group*

One general practice using both the leaflet and the PHE diagnostic flow chart reported that having proactive colleagues was a facilitator for their successful implementation.

"I know that I'm working in a very good practice that's quite forward, quite advanced" – general practice staff 3, focus group

3.2.1.5 Subtheme: Content improvements

All participants believed D-mannose should be included as an alternative treatment in the leaflet. Some clinicians were now recommending D-mannose to patients, and some older adults were aware of D-mannose as an antibiotic alternative having been suggested it by their clinician, and reported being happy to pay for it if it was going to work.

"Yeah, I would have said keep it in." – care home staff 7, focus group

"And then I spoke to the doctor and he'd been to an update and at the GP update they were encouraging patients to use D-Mannose. So I thought, that's good." – nurse practitioner 1, telephone interview

A few general practice and care staff expressed concern that the term 'life threatening' might cause anxiety in some older adults.

"So you've lost a few of the extreme, extremely anxious patients right at the first bit, can be life threatening. Because Google will always come up with the worst case scenario" – general practice staff 2, focus group

Some general practice staff wanted the leaflet to mention that three-day courses of antibiotics can be an appropriate treatment duration, as some perceive patients to be doubtful of their efficacy.

"The only, only thing is we get quite…a lot of patients question us giving three days of antibiotics…where it says about antibiotics are not always needed for urinary symptoms, maybe,

but if they are often a short course is sufficient to treat a urine infection, could be helpful." – general practice staff 3, focus group

Many care staff and some general practice staff expressed surprise that there was a lack of evidence for cranberry products, but felt that it was an important message in the leaflet to make older adults aware to avoid unnecessary purchases and over consumption of sugary drinks.

"But I've always thought that cranberry juice was fine." – care home staff 7, focus group

3.2.1.6 Subtheme: Poor working relationships between care homes and general practices

A few general practitioners believed that it was their role to cascade information (e.g. to stop using urine dipsticks) to care homes, however most general practice staff did not believe it was their role. Many participants, including some care home staff, believed poor communication between general practice and care homes inhibited implementation of the leaflet and other behaviours such as use of urine dipsticks.

"if you go to the care homes and you do in care homes one by one it will work very well…Rather than you doing with the GP practice and then you think GP practice will influence the care homes." – general practice staff 2, focus group

"there wouldn't be [a strong relationship with the care homes], if I was duty doctor this afternoon, I would probably get two nursing homes phoning to say that somebody very elderly, usually with dementia, is not right. We've dipped their urine and I'll say it as it is, I don't specifically have the time, unless it is something urgent, to go and then do a proper assessment and, oh well, it sounds as if they've got a UTI, let's try some nitrofurantoin, because I may have 30 or 40 calls to sort. So it doesn't help you, that's the context in which we're working." – stakeholder 7, telephone interview

Conversely, some stakeholders were hopeful that the leaflet would be implemented into care homes via their relationships with general practices.

"we actually posted out to all the GP practices because, often GP practices go to care homes, there's that relationship" – stakeholder 8, telephone interview

3.2.1.7 Subtheme: Too many facilities - too little time and resource

All commissioners reported that they did not have enough resources to conduct educational sessions with each care home and each general practice in their region and therefore opt for regional training sessions where they invite clinicians and care staff to attend. However, by using regional training sessions, commissioners could not be certain that the messages and resources had reached every care home or general practice in their area. High staff turnover in care homes was also believed to make implementation across a region difficult.

"I haven't walked through the door of everyone but we've posted out to everyone and we've held training events to which everyone's been invited." – stakeholder 8, telephone interview

"It was a two day course and it's like painting the Forth Bridge, due to the turnover. Somebody said to me, what about the rest of (location) and I said, that's a full time job." – stakeholder 3

Furthermore, due to other roles and responsibilities, commissioners felt that they could only dedicate a portion of time to this priority, and for some, implementation meant having to dedicate their personal time.

"And it's not my only job so that's why, I haven't been able to do more." – stakeholder 8, telephone interview

"But some of the work, I do in my own time…It's difficult to do it in the working day…it's just generally infections, and obviously UTI's is just part of that so it's difficult to do that." – stakeholder 6, telephone interview

East Kent commissioners reported utilising volunteer representatives called Links practitioners in all care homes and general practices to share responsibility for improving the identification/diagnosis and management of UTIs in their settings. Commissioners expressed concern that not all Links practitioners have been as proactive as others, and that they have been unable to monitor uptake of leaflet use.

"some are more enthusiastic than others, some are more proactive with, even in GP practices we've got some who are excellent, who are innovative and proactive, and I can contact them any time for any information and they would be very willing to assist. However, we've got some practices, GP practices, where they are not so proactive" – stakeholder 4, telephone interview

All commissioners intended to continue their work implementing the leaflet and conducting regional training sessions for carers and clinicians as they considered work to reduce *E. coli* bacteraemia's to be a priority, and believe that it will take time to change behaviours.

"if I think in my own head, what we've done is we've trialled or piloted some ideas and we've learnt from it …It's not a quick one. You've just got to be patient but keep moving forwards. I don't feel frustrated, I just feel there's more to do." – stakeholder 8, telephone interview

"I think some of these things are drip, drip really and it just takes a while for that message to get across…but it's going to take a while but yes, we will send out this message." – stakeholder 2, telephone interview

However, some commissioners believed that the development of new primary care networks has shed uncertainty on to the future of some commissioner roles.

"CCGs and the healthcare economy is changing…and with the implementation of PCNs …who knows really where this role, my role, specifically for primary care, will be in the future." – stakeholder 4, telephone interview

One nurse practitioner who had successfully implemented the leaflet in their general practice believed that implementation of the leaflet would be appropriate but difficult in the out-of-hours (OOH) setting. One stakeholder suggested that their local difficulties implementing in OOH were due to the transient nature of OOH staff.

"And the other difficult area to reach, of course, has been out of hours, which is just a whole other nightmare…anything that's implemented nationally or best practice, in out of hours is probably 12, 18 months later. Because they work with an, a bit of a more transient locum population, some of which are in practice, some of which aren't." – stakeholder 3, telephone interview

3.2.2 Theme 2: Identifying/diagnosing a UTI

The challenges to providing care and optimising antimicrobial stewardship in care homes are complex, therefore multi-faceted interventions are necessary to facilitate behaviour change (Dyar, Pagani, & Pulcini, 2015). Themes two and three explore the broad context of UTIs for the participant groups. Whilst these findings do not directly relate to the leaflet, they are included to address research objectives six and seven that aim to identify any indications of behaviour change in carers and primary care clinicians as a result of the leaflet, and any practice or beliefs that would suggest the need for further intervention developments in this context.

Despite evidence from theme one that the leaflet is used, theme two highlights participants difficulty in diagnosing UTIs in older adults and their continued reliance on inappropriate diagnostic tools.

'Care staff who had used the leaflet, used it as their guide for identifying and managing UTIs: "It's our guide for how we appoint this UTI" – care home staff 7.

This is important to consider as the leaflet contains explicit information to explain that urine tests are not appropriate for UTI diagnosis, and the leaflet contains a section on UTI signs and symptoms to look out for, as well as other causes of confusion to not be mistaken for UTI.

3.2.2.1 Subtheme: The difficulty of diagnosing UTIs in older adults

Whilst discussing the leaflet, general practitioners stated that care staff sometimes report vague symptoms, and as older adults can present atypically with UTIs, many clinicians expressed difficulty in diagnosing UTIs in this group, especially older adults with dementia who cannot communicate their symptoms.

"And then they say the patient looks a little bit more confused today or a little bit more agitated, it's not unusual, some of the behaviour, but again, that's again vague." – general practice staff 2, focus group

Many care staff acknowledged that residents would not or were unable to express their symptoms due to dementia or difficulty in recognising their own symptoms, making it difficult for staff to differentiate UTIs from other conditions such as constipation, dehydration and other infections as they can present similarly.

"She was very agitated last night and she was, didn't know whether she want, was hungry, thirsty, telling us that she was hungry but then she was really confused about what was in front of her and then when she went to the toilet she was fine after that." – care home staff 3, focus group

3.2.2.2 Subtheme: Reliance on inappropriate diagnostic tests

Some general practice staff reported relying on laboratory urinalysis results to not only confirm antibiotic susceptibility, but to also confirm diagnosis.

"OK I'm not going to start antibiotic until I have obvious MSU showing there is an infection or not," – general practice staff 2, focus group

Most care staff and some general practice staff disclosed that they were still using urine dipsticks to aid UTI diagnosis and, despite provision of the latest evidence during the focus groups, some care staff continue using urine dipsticks due to their conviction in their efficacy. However, some care homes intended to stop using urine dipsticks moving forwards.

"But we still carry on with that (urine dipsticks) one because some of them are symptomatic with that one so we have to follow just for the sake of proving that we have done something" – care home staff 7, focus group

"We feel that if it's not required then it's one less thing that you have to try and get from people" – care home staff 3

For some care staff, use of urine dipsticks was reinforced by a fear of missing cases of sepsis, as urine dipsticks were perceived to aid the early identification of infection.

"It's a worry isn't it? Because there's so much out there now about sepsis, you see it everywhere. And now you're saying, well actually, no we're not going to do the dipstick, which to us has always seemed effective," – care home staff 1, focus group

Use of urine dipsticks by general practice staff for diagnosing UTIs in care home residents appeared to be reinforced by perceived pressure from care staff contacting them with dipstick results for suspected UTI.

"Then we phone then GP surgery and give them the results and then they decide whether they give out the antibiotics" – care home staff 5, focus group

Additionally, use of urine dipsticks appeared to be reinforced by older adults in the community bringing in unrequested urine samples to general practice reception, often in unmarked and

inappropriate containers such as plastic bags and food jars; clinicians reported a desire to not be impolite which lead them to dip these urine samples. Some general practices had developed their own form to be provided at reception for urine submissions, which reportedly led to a decrease in urine submissions and facilitated triage.

"So lots of patients just dropping in samples that we never knew what they were for or whether to send it off," – general practice staff 3, focus group

3.2.3 Theme 3: Managing and/or treating a UTI

In order to address the objectives to identify indications of behaviour change in carers and clinicians, and inform further intervention developments, theme 3 contains findings on the importance of hydration to participants as a preventative, the difficulties associated with incontinence and the variation of practice when managing UTIs. These topics are contained within the leaflet, such as the urine colour chart for hydration monitoring, advice for those experiencing incontinence and general UTI management advice to unify practice, therefore the barriers to appropriate management may suggest further interventions are needed.

3.2.3.1 Subtheme: UTI management varies across clinicians

Many general practice staff admitted to variations in UTI management. Following an antibiotic audit, one general practice found high prescribing rates of trimethoprim which they attributed to variations in practice and not using national guidelines.

"I think most of the doctors were already aware, necessarily that Trimethoprim wasn't first line for quite a while but whether it was always happening or not…" – general practice staff 1, focus group

"…our surgery wasn't doing particularly well with our prescribing and prescribing probably a bit too much in total and also a lot of trimethoprim," – general practice staff 3, focus group

Many general practice staff reported prescribing UTI antibiotics over the phone without seeing the resident, and a few general practice staff reported prescribing UTI antibiotics as a result of patients demanding them, although this was a minority.

"to be honest it's never worth fighting that. You just give it because you know damn well that there's going to be a repeat consultation, there'll be a complaint, there'll be a whole lot of problems with it, and it's just not worth it." – nurse practitioner 3, telephone interview

Most general practice staff were aware that Nitrofurantoin was the current first line treatment for UTI, although few were aware of Pivmecillinam as an alternative. Some general practice staff were using delayed antibiotics with older adults in the community to avoid unnecessary use.

"sometimes if they're worried, then what I have done is, I've said to them, OK well I will give you a prescription to have at home as a just in case." – GP 2, telephone interview

3.2.3.2 Subtheme: The influence of continence on self-care and diagnosis

All older adults believed that maintaining good hydration could prevent or help manage a UTI. However, one care home resident, despite having had a severe UTI recently, aimed to drink less in order to avoid urinating at night.

"No, I'm not drinking more. I hopefully am drinking less." – care home resident 2, interview

Many care staff believed that residents did not want to drink in order to avoid regularly visiting the toilet, especially if the resident was frail, had poor mobility and required assistance.

"there's a few people I could think of now … she's like, oh I better not because I'm going to need to go to, just go to the toilet," – care home staff 7, focus group

Furthermore, staff reported that problems with continence can lead to difficulties in trying to provide a urine sample to clinicians, and may require nurse assistance. One care home resident reported that this had not been a pleasant experience for them.

"so often when you go for a check-up or anything they say, bring a sample with you and you're thinking yeah all right, where do I get my…It's not easy…I went to the toilet and they took a sample. Which wasn't very pleasant. But, the nurses do it, OK" – care home resident 1, focus group

A minority of care home staff reported attempting to obtain urine samples from used continence pads and all care staff reported changing soiled incontinence pads immediately, even if the resident had a limited pad allowance which many often do.

"you try and get a urine sample but that's normally fairly tricky because either they use continence aids, so then trying to get a sample off of a pad is quite, yeah, it's impossible really." – care home staff 3, focus group

"So, the residents are restricted on how many day or night pads that they're assessed or allocated but if we find a resident that is soiled or their pad is wet we automatically change it." – care home staff 5, focus group

3.2.3.3 Subtheme: Hydration is perceived as the most important preventative and self-care option

Most care homes reported providing hydrating alternatives to drinking such as soups, jellies, fruit and ice lollies to maintain good hydration and therefore good health in residents.

"along with ice cream, fruit, things like that, any way we can get water in someone we do" – care home staff 4, focus group

All care homes actively encouraged residents to maintain good hydration by conducting regular drinks rounds, providing a variety or drink options and verbally reminding residents to drink.

"Because you always make sure there's juices on the table or in their rooms and we always offer a drink to them" – care home staff 3, focus group

Some care homes, when they identify a possible sign of UTI, will try and encourage hydration first to see if the issue resolves before contacting the GP.

"first port of call is pushing fluids at least for 24 hours. If there's no change, we would then contact the doctor" – care home staff 3, focus group

Some care homes were providing cranberry juice as a preventative or self-care method, citing that if the residents were drinking and staying hydrated they were happy to continue providing it as an option, despite the lack of evidence.

"Some of the residents who have slight capacity will ask for cranberry juice…they like the taste so if they are going to ask for it and drink it, they're drinking water, that's brilliant." – care home staff 1, focus group

One care home reported benefiting from a smartphone application that provided prompts when residents should be given another drink. They believed that this had helped facilitate information sharing amongst staff compared to previous paper based methods.

"M Every resident is on there, you click on a resident it --

M Yeah it flags if fluid's needed, someone needs anything" - care home staff 6, focus group

3.2.4 Key findings and the Theoretical Domains Framework

Most of the findings from within the sub-themes described in section 3.2 have been deductively categorised with corresponding behavioural domains of the TDF. The findings are summarised in Table 7 with additional illustrative quotes from the dataset, categorised by the TDF domains and the three main higher-level themes as described above. Not all findings were deemed applicable to the domains of the TDF i.e. some from '3.2.1.1 A useful infection prevention and control tool' and all from '3.2.1.5 Content improvements', therefore these have been omitted from Table 7 but these findings are still considered when discussing the implications of the study.

Table 7: Key findings and corresponding TDF domains of the higher level themes: implementation of UTI resources including the leaflet, UTI diagnosis/identification, and management of UTIs in older adults.

TDF domain identified	Theme 1: Use and implementation of UTI resources including the leaflet	Theme 2: Identifying/diagnosing a UTI	Theme 3: Managing and/or treating a UTI
Knowledge	The majority of care staff had not seen the leaflet before: *"I can't even say that I've seen them in the waiting rooms or anything,"* – care home staff 1 Many care staff were surprised that the leaflet does not recommend cranberry products due to lack of evidence: *"I always thought cranberry juice was, was a good one"* – care home staff 5 Some general practice staff were unaware that there was no good evidence for use of cranberry products for UTI prevention or self-care: *"is that new to you guys then about the new evidence for cranberry?* *F Yeah.* *F Yeah."* – General practice staff 2	Only a minority of care staff knew they should not be using dipsticks: *"I heard that some of them went for the training…like six months ago, been advised not to follow the urine dip any more"* - care home staff 7, but most were still using them '*But we still carry on with that (urine dipsticks) one because some of them are symptomatic with that one so we have to follow just for the sake of proving that we have done something" – care home staff 7, focus group* Some care staff identified that other conditions can present like a UTI: *"Some of them will present as if it's a UTI but it's actually constipation."* – Care home staff 3 A few GPs were using urinalysis results as a diagnostic tool: *"I'm not going to start antibiotic until I have obvious MSU showing there is an infection or not"* – general practice staff 2 Many general practice staff reported prescribing UTI antibiotics without seeing the resident, with a few prescribing antibiotics as a result of patient demand. *"to be honest it's never worth fighting that. You just give it because you know damn well that there's going to be a repeat consultation, there'll be a complaint, there'll be a whole lot of*	Care staff rarely consider antimicrobial resistance: "*I suppose I know it's there because it's on the news and people talk about it and stuff like that...never thought about it to be honest."* – care home staff 6 Most general practice staff knew that nitrofurantoin was the first line treatment for UTI: *"We're doing nitrofurantoin and pivmecillinam and things. So, that we are good at."* – GP 2 All older adults knew that hydration could prevent or help manage a UTI: *"I've been drinking water since it's coming out my ears. Yeah, I've been trying to drink as much fluid as I can, so."* – older adult 2

		problems with it, and it's just not worth it." – *nurse practitioner 3, telephone interview*	
Skills	No participants reported lack of skills in using or implementing the leaflet.	Confusion was identified by all care staff as the most common indication of a suspected UTI: *"Normally it's increased confusion,"* – care home staff 1 All care staff stated they were familiar with residents which facilitates early identification of symptoms: *"the residents know them, they know the residents. So the symptoms, the signs I pick up very quickly."* – care home staff 7 Care staff expressed difficulty in obtaining urine samples, especially if the patient was incontinent or has dementia: *"you try and get a urine sample but that's normally fairly tricky because either they use continence aids…Or they'll go to the toilet and then you'll have faeces with the sample," – care home staff 3* Many clinicians expressed that diagnosing UTIs in older adults can be very difficult: *"often with UTIs, especially in old people…you're not quite sure what's going on…it might be a UTI…they're just given a prescription with no one really finding out what's going on, and it's a nightmare."* – GP 2	Most care homes provided alternatives to drinks to try and increase hydration in residents: "*We are a home that don't close our kitchen so they can drink throughout the night. Fresh vegetables, jelly, Fruit..."* – care home staff 5 All care homes actively encouraged residents to keep hydrated: *"I would say actually physically passing the drink to them, so you would encourage them to drink and usually they say, oh you know, I've had a lot today. We say, oh well just a little bit more and try and just sort of encourage them"* – care home staff 3 General practice staff reported having an independent approach to managing UTIs: *"I think historically we've just been really kind of like everyone does their own thing"* – general practice staff 3 All general practice staff encouraged hydration as a preventative and self-care method: *"Hydration is what I focus on."* – GP 1 Some clinicians reported recommending D-mannose as a preventative. *"And then I spoke to the doctor and he'd been to*

			an update and at the GP update they were encouraging patients to use D-Mannose. So I thought, that's good." – *nurse practitioner 1*
Beliefs about capabilities	No participants reported lack of perceived capability in using or implementing the leaflet.	All care staff reported confidence in their ability to identify early signs of illness: *"We're fairly observant of the symptoms and quite good at noticing changes in people and when they might be unwell"* – care home staff 2	Care staff and general practice staff were confident in their ability to manage diagnosed UTI.
Environmental context and resources	Care staff who had used the leaflet, used it as their guide for identifying and managing UTIs: *"It's our guide for how we appoint this UTI"* – care home staff 7 All care staff believed the leaflet will be a useful tool to help staff and relatives identify and manage UTIs: *"I think that might help the relatives understand a little bit more"* – care home staff 3 One OOH practitioner felt that the leaflet would be very difficult to implement in OOH settings: *"so I work in out of hours as well and the, it's not something that I routinely translate across into out of hours…there are certain things that you have to follow when you do out of hours work."* – nurse practitioner 3 The general practice staff using the leaflet tended to also use PHE's national diagnostic and treatment guidelines, or their own adapted version of the guideline as a complementary resource: *"We've all got, the flowcharts we've got them all in colour, they're laminated, they're in all the rooms."* – nurse practitioner 2 Some general practices have developed their own tool for patients to complete when dropping in urine samples: *"We've developed little forms that, now when people bring wee samples to reception, they just*	Some practices had developed their own diagnostic template to aid diagnosis: *"So we developed this system on protocol which we've not used before, for clinical staff to use like a prompt and help decision making processes"* – general practice staff 1 Some general practice staff would like guidelines specific to UTI diagnosis for dementia patients: *"It is tricky…it's sort of a process of elimination really…There must be some kind of guidelines specifically for dementia patients out there I'd imagine, we could look into it."* – General practice staff 3	One care home has benefited from a digital prompt system: *"At least it tells you how much fluid someone's had every day at the top of their thing…and that's a good thing."* - care home staff 6 All care staff reported changing soiled incontinence pads immediately, even if the resident has a limited pad allowance: *"So, the residents are restricted on how many day or night pads that they're assessed or allocated but if we find a resident that is soiled or their pad is wet we automatically change it."* – care home staff 5 Some care homes provide cranberry as a preventative/self-care, other care homes do not: *"We're not using cranberry products."* – care home staff 6 *"We're told to push plenty of it"* – Care home staff 4

	used to leave them with nothing. Now, they have a little form that we've done where they have to tick what symptoms they've got and why they've left the sample." – *GP 2* CCG stakeholders reported that high turnover of care staff makes implementation difficult: *"It was a two day course and it's like painting the Forth Bridge, due to the turnover. Somebody said to me, what about the rest of (location) and I said, that's a full time job."* – stakeholder 3 All CCG stakeholders stated that they did not have enough resource to provide education to all care homes and practices: *"we've got so many care homes I haven't got enough time in the day, as well as 70 odd GP practices,"* – Stakeholder 4		Some general practice staff were using delayed antibiotics to avoid unnecessary use: *"I've said to them, OK well I will give you a prescription to have at home as a just in case."* – GP 2 Many general practice staff were prescribing UTI antibiotics over the phone to care home residents: "*in the volume of work it's often, as you quite rightly say it's often over the phone"* – GP 1
Professional role and identity	Some general practice staff believed it was their role to cascade information to care home staff: *"as I say I've given the staff this, so some of them are laminating it and putting it on the wall for the staff, so we're getting there."* – general practice staff 3 Most general practice staff do not believe it was their role to cascade information to care homes: *"if you go to the care homes and you do in care homes one by one it will work very well…Rather than you doing with the GP practice and then you think GP practice will influence the care homes."* – general practice staff 2 Most older adults did not like the title 'older adults' as they do not associate themselves with the label: *"the only thing I didn't like about it was the wording at the top which says it's a leaflet for older adults and carers."* – older adult 2	This domain was not relevant in this context.	Care staff view their role as benefiting residents' dignity and wellbeing: *"we're proud of what we do and we're proud of what we could make the difference to people's lives. It's about their dignity, wellbeing, everything,"* – care home staff 7 The care home residents saw their role in treatment as being passive: *"Because they keep stuffing antibiotics into me. Whether I need them, I don't know."* – Care home resident 2
Beliefs about consequences	The majority of care staff believe that residents will not understand the content of the leaflet: *"if you want for the residents to read, this is too much for them."* – care home staff 7	Some care staff worried that not using urine dipsticks could lead to sepsis: *"they said, you*	

		didn't do the dipstick and I ended up in treating for UTI sepsis in hospital." – care home staff 4	
	All older adults believed the leaflet would help with the identification and management of UTIs better: *"I read the leaflet and yes, it's very helpful…when I looked at the worsening signs of urine infection I've had all those when it's been at its worst and I think people should know what it is and what to expect."* – older adult 3 Most older adults felt that the leaflet would benefit younger adults too: *"it's not just for older people, is it? I mean it's for, a lot of young people get it as well. So why is it targeted to older people?"* – older adult 2 Most commissioners believe that more work is required to ensure behaviour change in this context. *"I think some of these things are drip, drip really and it just takes a while for that message to get across…but it's going to take a while but yes, we will send out this message."* – *stakeholder 2, telephone interview*		
Optimism	This domain was not relevant in this context.	One stakeholder reported optimism that their work had reduced the amount of urines being bought in to general practice: *"receptionist love me because I stop that wave of urine that used to come in every morning, and the nurses said it was taking hours of their time"* – stakeholder 2	This domain was not relevant in this context.
Emotion	This domain was not relevant in this context.	A care home resident stated that providing a urine sample was not a pleasant experience: *"I went to the toilet and they took a sample. Which wasn't very pleasant."* – care home resident 2	This domain was not relevant in this context.
Memory, attention and decision processes	One practitioner would not use the leaflet with the over 85s as they feel it could be too much for some: *"it's knowing your patient well enough to think, is this going to add to my consultation or actually are we just better off talking very, very simply and having that as a conversation…rather than saying here's some information which backs up what we've talked about. I would spend more time with that older*	Care staff decided to use urine dipsticks as a result of noticing other symptoms: *"we usually notice something else which has caused us to do that test anyway…so we're not just relying on that."* - care home staff 2	Some care homes would decide to encourage drinking before concluding that the resident has a UTI: *"as harsh as it sounds we give them a drink and see if that perks them up and we see how far the confusion goes, we don't*

	patient so that they feel more comfortable in knowing that information." – nurse practitioner 3	One GP stated that they were mindful that atrophic vaginitis can sometimes present like a UTI: *"they've had tummy pain, dysuria, frequency and it's cloudy and they haven't got any itching, then I would treat it as a UTI but…especially in older women, I'm always thinking about have they got atrophic vaginitis, especially if it's a recurrent thing."* – GP 2	*automatically think UTI, it could be dehydration"* – care home staff 4
Goals	Some general practice staff reported that their overall goal was quality improvement: *"the thing is quality improvement…there's no point in doing stuff if you're not actually making a difference or it's going to be useful to you."* – general practice staff 1	This domain was not relevant in this context.	Older adults don't mind taking antibiotics as long as it makes them well: *"I just want to feel well, and I don't care what I take to feel like me you know."* – care home residents 1 One resident described drinking less in order to avoid urinating at night: *"because I keep going at night. Which isn't right…I'm not drinking more. I hopefully am drinking less."* – care home resident 2
Social influence	The general practices using the leaflet and following national guidelines reported having proactive colleagues as a facilitator: *"I know that I'm working in a very good practice that's quite forward, quite advanced…So we're ahead of the game. We're there with the forward planning of how we're going to go forward with the NHS and the struggles."* – nurse practitioner 1 One stakeholder suggested that difficulties in implementation in OOH was due to transient staff: *"The people who run out of hours say to me, anything that's implemented nationally or best practice, in out of hours is probably 12, 18 months later. Because they work with a bit of a more transient locum population"* – stakeholder 3	Care home staff feel pressured by GP staff to use and report dipstick results for suspected UTIs: *"they'll ask if you've done a urine dip, you'll say, yeah, you'll have to tell them what it's showing."* – care home staff 4 Many care home staff expressed that residents would not or were unable to tell them about their symptoms: "*A lot of them either don't recognise the symptoms or if you ask them they're going to say yes anyway."* – care home staff 7	Care staff believe that residents do not want to drink to avoid visiting the toilet regularly: *"they get worried about drinking too much because they don't want to keep going to the toilet"* – Care home staff 7 A few general practice staff reported prescribing antibiotics for UTIs as a result of demanding patients: *"there is always still that pressure to prescribe. I came here because I've got a urine*

		Some clinicians feel pressured by care homes to prescribe antibiotics based on a urine dipstick result: *"Sometimes we get a call from the care homes, they dip the urine and if it is positive and then they want antibiotic."* – General practice staff 2 Some practitioners were continuing to use urine dipsticks as they believe it is polite to do if a patient brings in a urine sample: *"I mean we don't blanket refuse it because if a patient comes with a sample it is polite to dip it."* – General practice staff 3 General practice staff stated that care staff sometimes provide vague information: *"they say the patient looks a little bit more confused today or a little bit more agitated, it's not unusual, some of the behaviour, but again, that's again vague."* – General practice staff 2 All general practice staff reported that they have had issues with patients bringing in urine samples to reception for dipping: *"lots of patients just dropping in samples that we never knew what they were for or whether to send it off, so we've tightened up on that." – general practice staff 3*	*infection and you are going to prescribe me antibiotics no matter what you think."* – nurse practitioner 3 Older adults aware of D-mannose were receptive to trying it as an antibiotic alternative: *"I went in and she immediately said I've been looking something up for you and she'd found them, they're expensive but if it's going to work then I'll pay the money."* – Older adult 3
Intentions	All GP staff expressed the intention to implement or use the leaflet: *"I will print it off and I will give, …I definitely will because I do like giving people information …so yeah, that is definitely something I will use."* – nurse practitioner 1	Some care homes intend to keep using urine dipsticks to identify UTIs: *"Because it's worked for us. It seems to have worked, I think that's the hard thing, because it always has seemed to work that way." – care home staff 1*	A few general practice staff expressed interest in conducting a UTI antibiotic audit: *"Auditing the antibiotic use would be really interesting to do, if we could do*

	A few general practice staff wanted to use the leaflet to educate those bringing in urine samples to reception: *"to have at reception actually…for the people that don't get as far as the waiting room and they drop in a sample or want to drop in a sample."* – general practice staff 3 Two older adults passed the leaflet on to friends and family: *"What I've done is, I've photocopied yours…just to give to my daughters because this sort of information is invaluable."* – older adult 1 All CCG stakeholders were intending to continue their implementation work of the leaflet and wider complimentary resources: *"next year…we're planning to run a day to really train people in how to improve their practice…that's how I really hope to roll it out."* – stakeholder 2	Some care homes intend to stop using urine dipsticks moving forwards: *"We feel that if it's not required then it's one less thing that you have to try and get from people"* – care home staff 3	*that that would be good."* – general practice staff 1
Behavioural regulation	Commissioner stakeholders stated that they have no way of monitoring leaflet use: *"I've got no way of knowing whether they used those leaflets,"* – stakeholder 3	This domain was not relevant in this context.	One general practice audited use of UTI antibiotics: *"We've re-audited the antibiotic prescribing…it's kind of improved…my trimethoprim prescribing's halved"* – general practice staff 3
Reinforcement	Those clinicians using the leaflet believe it reinforced the information they gave to patients: *"I find them helpful if I'm having a discussion with a patient and they're not really buying into what I'm saying…it's a little bit of extra evidence that I'm not some weird doctor trying to make up stuff."* – general practice staff 3 Stakeholders stated that because the leaflet links with many areas of infection prevention it reinforces its promotion in different infection prevention training sessions: *"I think at a time when people are feeling the pinch, they're very happy for messages that crossed over several goals, really."* – stakeholder 6	This domain was not relevant in this context.	This domain was not relevant in this context.

3.3 Intervention recommendations using the Behaviour Change Wheel

The key findings described in Table 7 emphasise the role of several TDF domains in the context of UTI identification and management in older adults that are not addressed by the leaflet or require additional intervention. These findings and the corresponding TDF domains have been applied to the BCW to identify COM-B classifications, intervention functions, policy categories and BCTs in order to make additional intervention recommendations for this context.

The TDF domains 'knowledge', 'beliefs about consequences', 'memory attention and decision making', 'environmental context and resources', 'professional role and identity', 'social influence' and 'goals' were identified as influential behavioural determinants which may benefit from further intervention. Whilst the leaflet contains information which addresses 'knowledge', 'beliefs about consequences', 'memory attention and decision making', 'environmental context and resources' and 'social influence', the leaflet is limited to four intervention functions; education, enablement, persuasion and environmental restructuring, and a small number of BCTs such as health consequences, information about social environmental consequences, instruction on how to perform the behaviour etc. Therefore, interventions which can target additional BCTs which are relevant to this context are more likely to influence behaviour change (Michie et al., 2014).

The key strategies identified from the BCTs include provision of information on health consequences, instructions, monitoring, additional resource, prompts, social support, behavioural contracts and removal of aversive stimuli. Examples of how these BCTs could be operationalised for this context include; education on UTI diagnosis, management, ASB and urine dipsticks, diagnostic guidelines for those with dementia, inclusion of care homes in the TARGET UTI workshop, a urine submission form for general practice, and continence regimes and aids.

Table 8 illustrates this process of identifying TDF domains to making further intervention recommendations in addition to the leaflet.

Finding	TDF domains	COM-B	Intervention functions selected	Policy categories selected	Behaviour change techniques selected	Recommendations and examples
Care staff lack of knowledge i.e. evidence for cranberry products, efficacy of urine dipsticks, purpose of urinalysis.	Knowledge	Psychological capability	Education and training	Service provision	Information about health consequences Instructions on how to perform a behaviour Self-monitoring of a behaviour	Online learning module or a face to face workshop specifically for care homes on: • UTI identification • UTI management • ASB and urine dipsticks
Some care staff worried that not using urine dipsticks would lead to sepsis	Beliefs about consequences	Reflective motivation	Education			
Care staff used urine dipsticks as a result of noticing other symptoms	Memory, attention and decision making	Psychological capability	Education and training			
Some general practice staff would like guidelines for diagnosis of UTIs in dementia patients	Environmental context and resources	Physical opportunity	Enablement	Guidelines	Adding objects to the environment	Develop UTI diagnostic guidelines for those with dementia
Most general practice staff do not believe it is their role to cascade information to care homes.	Professional role and identity	Reflective motivation	Education	Service provision	Information about health consequences Instructions on how to perform a behaviour	Incorporation of care homes into the TARGET UTI educational workshop for GPs to highlight the benefits to be gained from information sharing
All general practices reported issues with patients bringing in unrequested urine samples.	Social influence	Social opportunity	Enablement and Environmental restructuring	Guidelines/regulation	Prompts/cues Practical social support	A urine submission form to be completed for every submission including patient details, symptoms and appropriate urine containers.

Older adults drink less to avoid visiting the toilet regularly.	Goals	Reflective motivation	Incentivisation	Guidelines Service provision	Remove aversive stimulus Behavioural contract	Development of continence regimes taking older adults needs into account • Continence aids

Table 8

Intervention recommendations for the identification and management of UTIs in primary care and care homes using the TDF, BCW and BCTs

4.0 Discussion

This is the first study to explore the acceptability and feasibility of a patient facing evidence based UTI leaflet for older adults and their carers, in general practice and care home settings. Currently, there are no patient facing information leaflets for older adults on the topic of UTI, and no evaluation studies assessing acceptability and feasibility of patient facing resources on UTIs for any age group.

A deductive approach was initially employed, using the TDF to inform development of the interview schedules; followed by a hybrid approach for analysis (Fereday & Muir-Cochrane, 2006). ITA was used to develop key themes, and finally a deductive approach was adopted to place key themes into the TDF to apply to the Behaviour Change Wheel, in order to make further intervention recommendations. This flexible yet structured approach to analysis provided both a bottom-up data driven enquiry of the data, alongside a top-down approach (Swain, 2018). This novel study offers a valuable insight into the acceptability and feasibility of using the leaflet, including its interaction with other tools, its perceived value, and barriers and facilitators to its implementation. This has informed further developments to the leaflet, and insights into the current practice of care and general practice staff have informed recommendations for further interventions for this context. These findings and recommendations are discussed and compared against the existing literature in sections 4.1 – 4.7.

4.1 The acceptability and feasibility of leaflet use in primary care and care home settings

Many studies investigating leaflet use and/or effectiveness often fail to explore the acceptability and feasibility of their use, despite the Medical Research Council's guidance for the development of complex interventions (Medical Research Council, 2019) and experienced interventionists' recommendations (Yardley, Ainsworth, et al., 2015), stating that it is imperative to ensure stakeholders find interventions acceptable to facilitate their implementation, effectiveness and subsequent motivation to sustain intervention use.

For example, an RCT by Gauld (1981) assessed the effectiveness of written antibiotic information on the treatment adherence of women with uncomplicated UTIs (Gauld, 1981). Even though the experimental group were able to recall more of the information compared to the control group who did not receive the leaflet, there were no differences in compliance. Gauld (1981) did not explore the acceptability and feasibility of the patient information leaflet, therefore the knowledge increase found may not reflect patient satisfaction, ease of implementing such a

resource or the complexities around decision making in this context. Similarly, in a systematic review of leaflet effectiveness (de Bont, Alink, Falkenberg, Dinant, & Cals, 2015) many of the studies only reported effectiveness, and are therefore limited by not assessing acceptability for patients or for feasibility in real world settings outside of the controlled trial conditions.

Thus, whilst it is important to understand the impact of an intervention, it is equally important to understand whether the intervention will succeed in a real world setting and only through exploration and observation can this be achieved. Therefore, as a result of this present study, by gaining and understanding of how the leaflet is used and under what circumstances, it will inform implementation guidance for commissioners, the planned RCT and how to improve the leaflet.

All participants believed the leaflet was an acceptable tool for care homes and general practice, and would like the leaflet to be available in electronic and hard copy formats to suit varied preferences. Suggestions for dissemination included displaying the leaflet as a waiting room resource for receptionists to hand out to patients submitting their urine samples, and given to patients by clinicians during consultations for suspected UTI. Findings suggest that commissioners should consider promotion of the leaflet during training sessions for both care homes and general practices as an infection prevention and control resource. In addition, given evidence that practices appear to be struggling to disseminate information to care homes, it would be sensible for regional strategies to include plans for wide spread dissemination to care homes, including the facility to monitor of attendees and non-attenders of any training. Furthermore, due to implementation barriers, commissioners may want to consider electronic dissemination as a cheap and relatively easier method of disseminating the leaflet. This may include use of QR codes on posters or local integration within the GP clinical systems such as EMIS, SystemOne and Vision, including use of computer prompts as a reminder.

Evidence also suggests that most older adults would be happy to receive the leaflet. Therefore, the leaflet should be disseminated to care home residents, or where residents lack capacity or may find the leaflet overwhelming, the leaflet could be given to family and friends of residents to provide education and to reinforce messages from staff, such as hydration advice, self-care and prevention advice. A consideration for future work is the development of a UTI leaflet for all ages, as discussed in section 4.10. This may be more acceptable to those who do not relate to the label ‘older adults’ and to those who believe the information in the leaflet is relevant to people of all ages.

4.2 Value of the leaflet

Overall, all participants valued the leaflet. Commissioners valued its flexibility for use across different topic areas of infection prevention and control, and that it corresponded with Public Health England diagnostic guidance. Clinicians and older adults believed there is value in the leaflet beyond use with older adults and should be used with younger adults too; some older adults described the information as invaluable and shared the leaflet with their friends and family. Care staff valued the leaflet as their own educational guide to UTIs and they believed that having information in writing would reinforce their verbal advice and instruction to residents.

There have not been any leaflets developed for older adults on the topic of UTI, therefore drawing comparisons of perceived value across different leaflets, audiences and conditions is inherently difficult. A qualitative study evaluating an interactive information booklet for parents of young children 'When should I worry?', explored the views and opinions of parents and clinicians as part of a trial measuring the booklet's effectiveness (Francis et al., 2013). Francis et al. (2013) found that parents and clinicians valued the leaflet and many parents had kept the booklet for future reference. Francis et al. (2013) concluded that the role of leaflets and other information resources can help facilitate effective communication (Francis et al., 2013) by providing a prompt and a resource which can be referred to during discussions with patients indeed the patients reported valuing the leaflet as it provided reassurance and made them feel like they were being listened to. The link between effective communication of health information with clinical outcomes is well documented (Mikesell, 2013). Despite some similarities to the present study, these findings must be accepted with caution as leaflets can vary in content and quality, therefore perceived value will vary. However, the work of Francis et al and the findings in the present study demonstrate that provided a leaflet is deemed acceptable and feasible for use with its target audience, a leaflet can be valued as a communication tool which facilitates information giving, can provide reassurance to patients, can act as an educational tool for clinicians, patients and their families, which can also reinforce and work in parallel with other health tools for clinicians such as diagnostic guidance.

In this present study, some participants suggested that the leaflet may have some value in community pharmacy and out-of-hours settings (OOHs), although one nurse practitioner believed that implementation would be difficult in OOHs. Further work is currently underway to assess the acceptability and feasibility of using the leaflet in community pharmacy, details of which are provided in section 4.10 However further work is needed to explore the best approach for implementation in OOH settings. A study by Williams et al. (2018) explored primary care clinicians' experiences of prescribing antibiotics for respiratory infections in OOH settings, and

suggested that antibiotic prescribing decisions in OOHs are similar to those made in usual in-hours settings (Williams et al., 2018), and therefore recommended the adaptation of existing communication interventions specific to respiratory infections for use in OOH settings. Williams et al. (2018) highlighted a barrier also found in this present study, which is the constantly changing workforce in OOH settings, which can make sustainability difficult. Context appears to be very relevant, suggesting it may not be wise to extrapolate findings of a UTI leaflet from one study context to another on a respiratory infection resources, therefore suggesting that a specific study to assess the acceptability and feasibility of using the leaflet in community pharmacy and OOHs is warranted.

4.3 Barriers and facilitators to leaflet use in primary care, the community and care home settings

Despite efforts from each CCG to promote and disseminate the leaflet, lack of awareness was the biggest barrier to use, as several participants had not seen the leaflet before. Although some clinicians believed it was their role to cascade information to care homes, most did not, therefore the findings imply that weak working relationships between care homes and general practices could be a contributing factor to lack of implementation within each region. Lack of staffing and resource means commissioning teams are unable to visit every general practice and care home in their region to conduct training and promote use of the leaflet, which is further confounded by the high turnover of care staff. Therefore, commissioners are unable to monitor use of the leaflet or indeed ensure appropriate management of UTIs in line with national guidance. Many clinicians reported consulting for UTI with care home resident's over the phone and were therefore unable to issue a leaflet to those patients, highlighting the need for care staff to also be in a position to supply leaflets on behalf of clinicians when necessary.

A recent publication exploring how national primary care AMS interventions could be improved (Borek et al., 2019), recommended that due to the lack of leadership in general practice, AMS leaders should be appointed to encourage AMS. However, even though East Kent utilised Links practitioners in every facility to help disseminate information and engage colleagues, findings from this study suggest that, due to varying levels of enthusiasm of the Links practitioners, lack of time and competing priorities, this strategy might not be wholly successful. However, further work is needed to establish if this approach is effective.

The leaflet has yet to be nationally disseminated beyond publication by Public Health England. One stakeholder representing the Care Association Alliance recommended national dissemination via the CAA networks to ensure delivery directly to care homes, and an RCGP representative

recommended a short screencast with the RCGP to raise awareness amongst GPs. This finding suggests that national promotional strategies through the RCGP and CAA should be considered to ensure wide spread dissemination.

4.4 Further developments to the leaflet

Further improvements to the leaflet were mostly minor changes to content including use of less alarmist terminology such as 'life threatening' on page one, inclusion of three-day antibiotic course to address patient expectations for longer antibiotic courses and inclusion of D-mannose dietary supplement as a prevention option. However, after careful consideration, some participant suggestions will not be adopted. For example, one carer suggested the inclusion of the importance of maintaining a good diet as a preventative to UTIs, another carer suggested including suggestions for drink alternatives to water, and a GP suggested including specific fluid requirements. These suggestions and several others were discussed at length during the leaflet development phase by experts from across the UK who decided to not include them in the final leaflet (L.F. Jones et al., 2020). In the interest of keeping the content to a minimum (length of a leaflet relates to its readability (DuBay, 2004; Protheroe, Estacio, & Saidy-Khan, 2015)), as these were only suggestions rather than strong recommendations based on new information / evidence, they were deemed unnecessary and were not included.

Overall there were very few constructive criticisms of the leaflet's content, appearance and layout, which is not typical. For example a Slovenian study by Poplas-Susič, Klemenc-Ketis, and Kersnik (2014) qualitatively explored patient views of medication information leaflets with 42 patients of mixed ages and genders. Participants' main criticisms were font size, paper quality, writing style and size of the paper (Poplas-Susič et al., 2014). Whilst these constructive criticisms were not observed in this study, it is important to note that these were issues raised during the leaflet development phase with patients and clinical experts and were addressed iteratively (Leah Ffion Jones, Emily Cooper, et al., 2018) using a person-based approach (Yardley, Ainsworth, et al., 2015). During the development phase, issues such as use of pictures, colours, large text and simplified language were addressed (Leah Ffion Jones, Emily Cooper, et al., 2018), and therefore may offer some explanation as to why there were fewer criticisms relating to the general acceptability of the leaflet, and why the majority of findings related to implementation and dissemination (Yardley, Ainsworth, et al., 2015).

4.5 Leaflet interaction with UTI diagnostic tools and other resources

A key to facilitating behaviour change in this context will be the development of interventions that are designed to complement the older adult UTI leaflet, which together will target a greater

number of behavioural determinants and increase the likelihood of positive behaviour change. One such resource, is PHE's UTI diagnostic guidance; general practice staff reported that the leaflet tended to be used alongside either PHE diagnostic tools or locally developed diagnostic tools as part of quality improvement initiatives within general practice. Some general practice staff reported that quality improvement was their overall goal. One stakeholder was optimistic that their work in implementing training, leaflet use and diagnostic guidance had reduced the amount of unrequested urines being submitted to several GP practices in their region.

A key finding by Gauld (1981) that increased knowledge does not always influence behaviour, highlights that to ensure behaviour change interventions need to go beyond education, and examine the complexities of the barriers faced. Indeed, whilst this leaflet has been identified in this study as an important intervention for increasing knowledge that may change the behaviour of some, it is by no means the magic bullet to reducing UTI rates and antibiotic use. To maximise its influence it should be used amongst the other TARGET UTI resources which target a wider variety of behavioural determinants, such as the PHE diagnostic guidelines, audits, eModules and self-assessments (Public Health England, 2012c). Commissioning organisations and national bodies promoting the leaflet should also promote the complementary TARGET UTI resources and any other locally developed UTI resources alongside it. Additionally, primary care clinicians using the PHE diagnostic flow charts may want to consider use of the leaflet as a complementary resource to reinforce and communicate their diagnostic decisions with patients, this may go some way to unifying the way clinicians manage UTIs.

4.6 Indications of behaviour change in carers and primary care clinicians

Whilst there were some indications of positive behaviour change such as clinicians promoting use of D-mannose as a preventative and use of delayed prescribing, many of the negative behaviours identified in the needs assessment work were still reported, such as use of urine dipsticks to diagnose and treatment of non-specific symptoms with UTI antibiotics. Nevertheless, all commissioners reported their intentions to continue their promotion of the leaflet alongside the diagnostic flow charts within their local UTI or infection prevention campaigns. It was suggested by commissioners that it will take a long time to change behaviour, therefore the four-month implementation period used in this study may not have been sufficient to allow for significant changes. A challenge faced by researchers is knowing how long to implement interventions for when conducting evaluations (NHS Employers, 2014), therefore, for the planned RCT, longer implementation periods will be considered.

Despite national guidance and information in the leaflet, this study found that only some care homes intended to stop using urine dipsticks, whereas many carers reported continued reliance on urinalysis and urine dipsticks, which is perpetuated by members of the general public presenting with unrequested urine samples at general practice receptions, and perceived pressure from care staff and clinicians, although there was some optimism that local efforts including the leaflet had reduced the amount of unrequested urine submissions. Nevertheless, it appears that little has changed since Schweizer, Hughes, Macauley, and O'Neill (2005) which reported similar barriers to appropriate management, such as difficulties faced by staff in obtaining urine samples and staff resorting to 'dipsticking' incontinence pads as a result, findings which are consistent with this study.

The 'To Dip Or Not To Dip' quality improvement programme led by NHS Nottingham aims to eliminate use of urine dipsticks in diagnosing UTIs in care home residents (NHS Nottingham, 2017). Regional evaluations of this quality improvement scheme have found significant reductions in numbers of UTI antibiotics prescribed in care home residents, unplanned hospital admissions, urosepsis and acute kidney injury (Beech, 2017). This demonstrates that stopping the use of dipsticks for UTI diagnosis could have an overall positive effect on patient outcomes. These findings should be highlighted to those sceptical of stopping using urine dipsticks to diagnose UTIs in older adults and could form part of the educational interventions recommended in section 4.7.

Care staff are motivated by wanting the best for their residents and to improve their wellbeing, they reported consistent use of genital hygiene and hydration strategies by providing regular incontinence pad changes and a variety of drink options such as cranberry juice, and drink alternatives such as jellies. Although it is important to note there was also evidence that older adults can aim to reduce their fluid intake in order to avoid regular toilet visits. Therefore, although the leaflet may support local hydration initiatives, the leaflet alone may not improve hydration levels if older adults are concerned about toileting. A 2008 study examining overactive bladder syndrome in the elderly recognised that some older adults may reduce fluid intake to manage incontinence (MacDiarmid, 2008), as found in this present study. MacDiarmid concluded that not only does this cause dehydration, but that highly concentrated urine can aggravate the bladder lining which can perpetuate the symptoms of incontinence, cause constipation and lead to further UTIs. Further research is needed to develop specific interventions to improve residents' hydration levels which include continence regimes and considers individual residents' needs.

The leaflet features a section on the signs and symptoms of UTI to look out for, with a section on other causes of confusion such as constipation, pain etc. However, staff frequently reported

difficulty in diagnosing UTIs in patients with dementia, as they can struggle to identify urinary specific symptoms, other conditions can also present like a UTI, and often the only presenting symptom is confusion or changes in behaviour. In previous research that has investigated perceptions of primary care clinicians servicing long term care facilities, Walker et al. (2000) reported that ordering of urinalysis and antibiotic prescribing is influenced by the presence of non-specific symptoms. Indications are that carers and clinicians should receive further resource to enable accurate diagnosis in dementia patients, this is further discussed in 4.7.

4.7 Recommendations for further intervention developments around UTIs in older adults

As previously discussed, a leaflet alone is unlikely to address the problem of UTIs and AMR, however, as a result of the barriers identified in the present study discussed in sections 4.1, 4.2, 4.3, and 4.6, a number of intervention recommendations have been made. These are: further education on UTI diagnosis and management, asymptomatic bacteriuria (ASB) and urine dipsticks for care staff and general practice staff; diagnostic guidelines for those with dementia; delivering the TARGET UTI workshop to care homes; a urine submission form for general practice, and continence regimes and aids. If incorporated appropriately, these interventions could result in positive behaviour changes, by reinforcing existing elements of the leaflet and by addressing additional intervention functions beyond 'education', 'enablement', 'persuasion' and 'environmental restructuring' currently targeted by the leaflet.

The development of a nationally available urine submission form for general practices to download and use, complementary to my leaflet, may go some way to helping mitigate the issue of unrequested urine samples being dropped off at general practice receptions. The provision of such a form could be provided alongside appropriate urine containers and include patient age to ensure that appropriate diagnostic guidelines are used, and details of signs and symptoms to watch for to ensure appropriate triage of the patient. Whilst I believe that the addition of such a form would provide valuable information to aid triage, the additional work required to process the information may not be well received by receptionist staff and therefore the introduction of such a form would require their buy in and full understanding of its potential benefits if used consistently.

Currently, PHE provides resources for face to face and online training for primary care clinicians on UTI management. However, the development of an additional educational training resource is needed specifically for care staff on ASB, UTI identification and management, to highlight the mechanism of urine dipsticks and their lack of accuracy in diagnosing UTIs in older adults,

ensuring consistent practice with primary care. This aligns with Walker et al. (2000) conclusion that long term care facilities require more education on these topics. Therefore, both sets of training for care staff and primary care clinicians should include appropriate practice for both settings to encourage sharing of information and best practice between facilities. Such a strategy would complement efforts to reduce urine dipstick and antibiotic use, and emphasise the importance of prevention and self-care strategies. I believe that the addition of education as an intervention is crucial to initiating behaviour change. However, due to the barriers identified in this study around accessing educational courses, stakeholders should consider a variety of modes of educational delivery (e.g. face to face and online) to facilitate more equitable and wider access and to cater for preferences.

Currently, PHE provide diagnostic tools to primary care clinicians to aid the diagnosis of UTI in children, UTI in under 65-year olds and UTI in over 65-year olds. Whilst the over 65s diagnostic flow chart does not exclude dementia patients, GPs requested more specific guidelines for this group, therefore in addition it is recommended that further literature reviews are conducted to assess the feasibility of developing a diagnostic flow chart specifically for older adults with dementia. I believe that providing clinicians with further reassurance around diagnostic certainty would improve UTI management and would encourage better practice. An associated barrier would mean lengthening the PHE diagnostic guidance, however a current criticism is that it is already a lengthy document, therefore a solution may be to create two sets of guidance, one for older adults and one for uncomplicated UTIs.

A similar study by Fleming, Bradley, Cullinan, and Byrne (2014) explored antibiotic prescribing in long term care facilities using the TDF and BCW, and recommended the provision of: education on the topic of antibiotics, prescribing guidelines and AMR; provision of guidelines and supporting evidence. Even though Fleming et al. (2014) explored general antibiotic prescribing across conditions without a UTI focus, a similar recommended outcome of this study included provision of education for care homes on the topic of UTI identification, management and ASB. This study further supports the need for additional resources in care homes, specifically around UTI education and provision of guidance.

4.8 Strengths and limitations

Several areas warrant discussion and reflection in relation to the strengths and limitations of this research, including the methods for data collection, the sample recruited, the recruitment strategy and the utility of the behavioural theory used.

4.8.1 Data collection

Becker and Geer (1957) argue that interviews and focus groups are limited as they are self-reported and are susceptible to being distorted, and therefore can result in misleading findings. They propose that problems such as these arise when interviewers are not familiar with the 'local language'. Although I have experience of working with clinicians on the topic of UTIs there was an occasion during the second focus group in general practice where my lack of 'local knowledge' (in this case, clinical knowledge) almost resulted in missing an important finding. During this focus group, a clinician remarked that they would not prescribe antibiotics until a urinalysis confirmed a UTI, but it did not occur to me until data analysis that using urinalysis as a diagnostic tool was inappropriate, and as a result I was unable to probe and elicit further information at the time of the focus group. This emphasises the value of conducting data analysis iteratively throughout the data collection period to identify interesting points to include in future discussions, and the value of having a double coder who can identify anything missed in the data.

R. Elliott et al. (1999) states that an important feature in good quality qualitative research is providing credibility checks which can be undertaken by using multiple researchers, double coders, cross referencing with similar groups and comparing qualitative perspectives. Similar approaches are also mentioned in other quality criteria such as the SRQR (O'Brien et al., 2014), the COREQ checklist (A. Tong et al., 2007) and the 'Big Tent' criteria (Tracy, 2010). Whilst it was important for me to conduct this doctoral research independently, in future research, I will consider conducting interviews and focus groups alongside a colleague with a clinical background who can ensure that information is not missed. This would add strength to the quality criteria of providing 'quality checks' beyond having a double coder.

4.8.2 Sample

It could be argued that the care staff and general practice staff that participated in this study, self-selected due to interest in the area. I anticipated this as a potential limitation and attempted to mitigate this by making initial contact with all care homes and general practices in each region, introducing randomisation and stratification to follow up contact, and by providing high street vouchers as incentives. Randomisation ensured recruitment of a variety of different general practices and care homes in terms of location, leaflet use and interest in the topic area, and the high street vouchers provided a strong incentive to participate over and above interest in the topic area. This is evidenced by the findings such as variation in clinical practice and variations in use of the leaflet and other tools. Whilst it is unusual to introduce randomisation and stratification to a qualitative study (Guest et al., 2013), it was important in this context to ensure a certain degree of transferability in the sample, as over representation of positive attitudes

towards the leaflet (Guest et al., 2013) would be problematic for an acceptability and feasibility study, as it could lead to misinformed funding for implementation.

An important ethical consideration for this study was to recruit older adults with capacity to provide informed consent. I delegated the responsibility of identifying eligible older adults to care home managers, practice managers/clinical leads. As a result, older adults who participated in this study were considered the most capable compared to their peers. This is a limitation of this study because I was therefore unable to interview those older adults with limited capacity that were deemed unsuitable to receive the leaflet due to the content being too 'overwhelming' or 'too much for them'. Those individuals may have been able to contribute useful suggestions for improvements to the leaflet such as areas to simplify or offer useful insights into their personal barriers of managing their own UTIs which could be addressed in the leaflet. This will be a consideration taken forwards to the RCT planning, to try and recruit older adults with full capacity but are deemed unsuitable to receive the leaflet due to perceptions that they would be 'overwhelmed', or recruitment of relatives to provide insights on the behalf of those residents who lack capacity.

A further consideration of this study was the fact that care homes with a CQC rating of 'inadequate' were not eligible for participation in this study, so as not to distract from care improvement efforts (ENRICH - Enabling Research in Care Homes, 2017). According to the CQC website (Care Quality Commission, 2019), only three of 306 care homes across both regions fell into the 'inadequate' category and therefore no attempts were made to recruit these. However, it is important to note that despite not having actively recruited 'inadequate' care homes, due to the high turnover of staff in the social care sector, carers who had previously worked in 'inadequate' care homes and were now working in higher rated homes had the opportunity to participate and discuss their experiences. Whilst information on previous care home CQC ratings were not collected, all care home staff participants were asked to reflect generally on their experiences across their career working in care homes.

As 'inadequate' care homes only represented less than one percent of all care homes, it is unlikely that by omitting these from the recruitment strategy, any major findings were missed. Nevertheless, care staff and residents in 'inadequate' care homes are an important audience for the leaflet and it would be useful to understand how the leaflet could be used in those care homes as novel educational and persuasive resource. A consideration for the larger RCT to evaluate the UTI resources may be to recruit care homes that have previously been rated as 'inadequate' in order to discuss the acceptability and feasibility of using the leaflet under those

circumstances, and to capture information about the CQC ratings of the care homes that carer participants have previously worked in.

As I reflect on the sample in this study, I regret not being able to recruit a representative from the Royal College of Nursing (RCN). I initiated contact with a representative willing to participate, but due to their busy schedule, I was unable to book a time slot within my recruitment period. Having the input from a national representative with experience of implementation and engagement with primary care and district nurses could have been influential to my implications for implementation. National society representatives by the nature of their roles have busy schedules, and therefore for future research I would initiate contact at the beginning of the study, stating my intentions for recruitment with the view of booking in a time slot far in advance.

Additionally, this study would have benefited from a greater representation of primary care clinicians from East Kent. I believe the main reasons for low recruitment figures was because of my limited availability to conduct focus groups due to travel time to East Kent. For the national RCT I will ensure recruitment is delegated to local stakeholder teams who may have better luck as they will be known to local primary care teams. Also, if a grant is awarded for the RCT, there will be sufficient funds for travel to conduct focus groups. Whilst ensuring a sufficient and appropriate sample is not specified in the R. Elliott et al. (1999) quality criteria, it is mentioned in the "Big-Tent" criteria (Tracy, 2010) to ensure rich rigour in qualitative research. I believe the addition of an RCN representative and additional primary care clinicians from East Kent would have been beneficial to this study and therefore will be a strong consideration for future research and the planned RCT.

4.8.3 Recruitment

Recruiting general practitioners was difficult. This led to an adaptation to the recruitment strategy to recruit from a pool of GPs that had expressed an interest in research participation as part of a parallel study (full details of the adaptation can be seen in section 2.2.4). This needs to be considered as a limitation as one GP was recruited through this additional method. The GP recruited did not have a specialist interest in UTIs, but their enthusiasm for research implies a level of proactivity not necessarily held by other participants. On reflection of the interview, their proactivity was evidenced by their good management practice and their use of the leaflet, although they did provide constructive criticisms of the leaflet.

A recruitment barrier which I had not anticipated was the amount of practice managers unwilling to circulate the study information to their clinical teams. This is not something I have encountered in my previous research in general practice, and as many of the practice managers reported lack

of time as the reason for non-participation, I believe the lack of engagement stems from the current and increasing pressures on workload in general practice (BMA, 2019). As well as causing delays to the recruitment period, it could be argued that this has led to the recruitment of general practices with fewer pressures, however this is a generalised perception from the practice manager and not necessarily the views of the clinicians they are representing. In my future work with general practices I may consider other recruitment strategies which involve direct contact with clinicians such as via CCG newsletters or local events.

4.8.4 Behavioural theory

The TDF is a widely used framework and is celebrated for its systematisation of behavioural theory (Johnston, 2016), however there are important criticisms of the TDF and BCW which should be considered. Ogden argues that the systematisation of behavioural theory has occurred too early in the history of behavioural science, and that further behavioural insights are needed before synthesising the evidence to form a unified theory (J. Ogden, 2016; Jane Ogden, 2016). Ogden instead wants to promote variability across behaviours rather than systematisation. However, currently there are no behavioural frameworks specific to AMR or UTI which could have been applied to this study, therefore the TDF with its functionality to inform intervention recommendations is arguably an appropriate tool for this context.

Nevertheless, it is evident from this study that there are elements which appear to be separate to the TDF, and domains within the TDF which are not relevant to the behaviours being explored, suggesting that this systematisation does not provide a 'perfect fit'. For example, most of the findings from the subtheme '3.2.1.5 content improvements' and some from the subtheme '3.2.1.1 A useful infection prevention and control tool' were not relevant to the TDF and were therefore presented separately.

When I embarked on this study, I decided to use all of the 14 domains of the TDF to ensure full coverage of the behavioural determinants. However, I know from my previous AMS research in primary care that not all of the domains are relevant and indeed this is acknowledged by the developers of the TDF (Atkins et al., 2017). For example, I have found that emotion and reinforcement are rarely relevant for clinicians in this context (Leah Ffion Jones, Rebecca Owens, et al., 2018). Furthermore, using ITA was intended to mitigate any restrictions imposed by the structure of the TDF, allowing for themes to be developed which may not necessarily fit well into the domains of the TDF.

For this study the TDF and BCW provided a useful framework on which to explore behaviour and make intervention recommendations, but not all findings relating to the leaflet could be transposed to the TDF.

4.9 Researcher's reflections

In order to deepen my learning of this research process, I have completed a reflective log of my work activities using Rolfe's framework (Rolfe, 2002), allowing me to reflect on the research process and how I can improve my practice (Winkel, Yingling, Jones, & Nicholson, 2017). Researchers will always bring their own biases to a study (Davis, Couper, Janz, Caldwell, & Resnicow, 2009); it is important therefore to acknowledge them to allow readers to understand the perspective of the authors (Cohen & Crabtree, 2008), and to try and mitigate them where possible. I would like to expand here on two of my log entries on my experience of conducting focus groups in general practices and care homes, by detailing a comparison of both settings, and a reflection on my researcher position.

An important consideration for me throughout this research process has been my role as the developer and the evaluator of the leaflet. I have been mindful of the potential confirmatory bias that I could have brought to this study (Cohen & Crabtree, 2008). Some may argue that having developed the leaflet, I therefore have a vested interest in the success of the leaflet and may be inclined to portray the leaflet positively.

Whilst it could be argued that depending on the research paradigm, acknowledgement of the researcher's perspective could be perceived as a limitation or a strength to the research (Cohen & Crabtree, 2008), I would argue that in this and similar studies, research bias is a limitation and should be mitigated. Failure to mitigate researcher bias in this study could lead to inappropriate investment into the leaflet, wasted time and resource into implementing the leaflet and if there is an undesirable outcome, there could also be a loss of trust and therefore organisational implications.

My attempts to mitigate researcher bias has been to utilise patient input into the interview schedule development, use of a double coder to identify initial themes and by presenting the results to both regions and receiving their feedback. During the interviews and focus groups, I also explicitly described the leaflet as being a PHE product rather than an intervention that I had developed for PHE.

My perspective on the leaflet and this study was that I wanted to conduct a comprehensive and high-quality study in order to obtain useful findings that could be used to improve the leaflet, its

implementation and its intervention functions to maximise behaviour change. I understand that the leaflet is a work in progress and, over the coming years, will change as new evidence is published, health care structures change, user needs change and new technology develops.

As a result of wanting to conduct a comprehensive study which represents many views, I obtained a large sample size of 93 participants across a range of stakeholders, patients, clinicians and carers. A challenge to handling large qualitative data can be ensuring trustworthiness of data and consistency of data collection and coding across the research team (White, Oelke, & Friesen, 2012). This however, was not an issue in this present study as I collected and analysed all data. On reflection, a challenge for me was ensuring representation of the wide variety of views in the write up. There is the limitation that due to the large data set and my interpretation of what I consider to be important, that not all views are reported in the final thesis. In order to minimise this risk, I ensured that I reported conflicting views within and between participant groups, such as the variance in use of the leaflet, the various suggestions for dissemination, and the different practices among clinicians and carers.

A further point of reflection for me has been the utility of interviews and focus groups in care homes and general practice settings. Conducting focus groups in general practice highlighted to me the individual and siloed nature of being a primary care clinician (A. Shaw, De Lusignan, & Rowlands, 2005). During discussions, it became apparent that each clinician had a different approach in terms of diagnosis, treatment, self-care advice, safety netting, recording of patient notes and use of resources. Bringing clinicians together to discuss their individual practice was a fruitful method for eliciting broad data, as their peers would often curiously probe their colleagues further and then discuss their differences openly (Bauer & Gaskell, 2000).

In sharp contrast, I found that practice tended to be uniform across care homes, with little variation in the identification and management of UTIs. Focus group discussions therefore generated narrower data, and elicited an agreed consensus amongst the teams throughout discussions, making it somewhat difficult to probe other team members.

I suspect this difference occurs due to the physical working environments of both settings. In general practice, clinicians work in their own consultation rooms with little time for sharing practice with colleagues (A. Shaw et al., 2005). This may also be reinforced by CPD requirements and therefore the individual nature of pursuing interests and further training. Comparatively, in care homes, teams work within the same environment, with the same residents and learn directly from each other, therefore unifying their behaviour.

In addition to my reflection on using focus groups in care homes, I have also reflected on the use of interviews and focus groups with older adult care home residents. An ethical consideration for this study was the sensitive nature of discussing UTIs, therefore I only provided older adults with the offer of interviews to facilitate privacy and the opportunity to discuss experiences freely. However, I found that in one care home three older adults were very keen to discuss their experiences as a group and declined the opportunity to interview, exclaiming that they did not mind sharing their experiences amongst friends. I was happy to facilitate their request and adapted my interview schedule accordingly for a focus group scenario. On the whole, the older adult participants were forthcoming with sharing their experiences, therefore for future research I think it would be reasonable to provide older adults with both options for data collection to allow those who want privacy to receive interviews, and those who are open to sharing their experiences to participate in focus groups.

Similarly, due to the sensitive nature of the topic, I collected limited demographic data from the older adults who participated. I believed that the less potentially identifiable information I had would facilitate open and honest discussions. However, as I have noted above, older adult participants were very forthcoming in their discussions and came across as very comfortable talking about UTIs. Therefore, in future research on this topic I would collect additional demographic data such as age, comorbidities, disabilities, catheter status etc. which would have allowed me to ensure a wide variety of older adults participated with a range of experiences.

This reflection will influence my design of the qualitative component for the national RCT to evaluate the TARGET UTI resources. I will certainly use focus groups in future with general practices, but I will consider using only interviews with care staff as interviews may facilitate for further individual probing and therefore generate richer data (Bauer & Gaskell, 2000).

Further reflection on the limitations of this study has highlighted a number of methodological considerations which will require discussion during the design stages of the future RCT, as well as the reflection mentioned above. Firstly, we may want to consider extending the implementation period or extending the data collection period for up to 12 months to ensure implementation occurs. Secondly, I will recommend that we extend recruitment to include relatives of older adults who lack capacity to explore how they may use the leaflet with their relatives, as arguably this study lacked this important insight. Thirdly, to collect information from carers about any previous experience in working in an ‘inadequate’ rated care home and how the leaflet may or may not be implemented in such a setting. Fourthly, I will offer older adults interviews or focus groups depending on their preference, as well as consider collecting additional demographic data such as

disabilities, comorbidities, catheter status etc. Finally, to help facilitate the recruitment process I will recommend that we utilise local stakeholders who, due to their familiarity with their local care home and general practices, may have better success in recruiting participants.

4.10 Leaflet developments and further evaluation

Adaptations to the older adult UTI leaflet were made at the end of the study, based on the suggestions from the participants and where good quality evidence supported the changes. Changes were not made if suggestions conflicted with the evidence base, and changes which contradicted previously agreed consensus from the steering group were planned to be put back to the steering group for re-discussion, although this did not occur as the minor content changes were not considered to be of a contentious nature to require circulation to the steering group. Preliminary changes made to the leaflet are outlined in the following paragraphs.

A piece of work which was running in parallel to this feasibility and acceptability study in general practice and care settings, was a project in which the Primary Care and Interventions Unit (PCIU) commissioned Imperial College London (ICL) to explore the acceptability and feasibility of the older adult UTI leaflet for use in community pharmacy. The PCIU and the ICL teams met to discuss progress in October 2019; during the meeting I presented the findings from this study.

The finding that older adults do not associate with the older adult label and that participants believed the leaflet content would be relevant for all ages was corroborated by the ICL teams' work in community pharmacy. Therefore, we decided as a group to pilot the amalgamation of the older adult UTI leaflet with the uncomplicated UTI leaflet for younger adults. This involved re-formatting the uncomplicated UTI leaflet to represent the aesthetic of the older adult UTI leaflet and therefore retaining the important aspects for health literacy such as font size, information chunking etc. Additionally, information specific to older adults was inserted as separate boxes to be considered by older aged readers. The uncomplicated UTI leaflet contains information on course duration and D-mannose as an antibiotic alternative, both of which were items requested to be inserted in the older adult leaflet.

This amalgamated leaflet is currently being investigated in community pharmacy by the ICL team. The findings from the ICL study will inform whether the older adult UTI leaflet is kept as a separate resource or whether it will continue as a single UTI patient resource, and offer an insight into implementation in community pharmacy.

4.11 Recommendations for Health Psychology

4.11.1 Recommendations for use of the Theoretical Domains Framework

As discussed in section 3.2.4, one of the limitations identified in this study is that not all findings fit well within the TDF. It could be argued that the findings associated with content improvements described in 3.2.1.5 could be presented within the domain 'environmental context and resources' as the findings specifically relate to a resource i.e. the leaflet, and as one of the intervention functions of the leaflet is 'environmental restructuring' it is therefore important to capture the nuances of this behavioural domain. However, as in this study, other similar studies may find that the domain 'environmental context and resources' contains too many findings to provide meaningful implications. Future studies using the TDF, especially intervention studies, may benefit from dividing this domain into 'environment', 'context' and 'resources', as separate domains. Certainly, in this present study the physical working environment (location of leaflets, physical access to hard copies etc.), the cultural and historical context (NHS quality premium, culture of using dipsticks etc.), and the physical resources (Provision of different formats, access to diagnostic guides etc.) each have an important and different impact on behaviour. Although this solution increases the size of the TDF, it increases its specificity for intervention functions category 'environmental restructuring' and should be considered, especially if the domain is filled to the point of becoming cumbersome.

A further consideration is the necessity of having a determinant framework relevant to the study of antimicrobial resistance and common infections. Historically, models and frameworks of behaviour have either been developed for specific health behaviours such as the Transtheoretical Model for smoking cessation (Prochaska & DiClemente, 1984) or have been designed to apply to a variety of common health behaviours such as exercise, alcohol consumption, physical activity etc. Currently there are no behavioural frameworks which have been designed specifically for the study of AMR and common infections. The TDF addresses my concern partly, as it is an all-encompassing model and therefore should be applicable to any behaviour, however there are limitations as I have outlined above. I believe that health psychology has a role in developing a model relevant to this context which can be used by psychologists and non-psychologists in understanding these complex behaviours, in order to develop and initiate targeted antimicrobial stewardship interventions which are grounded in the barriers and needs identified.

4.11.2 Implications for health psychology

Despite AMR being a topic within microbiology, health psychologists can play a role in tackling this global health issue. It may not always be possible for a health psychologist to understand the

constant changing landscape of microbiological epidemiology, but through successful multi-disciplinary team working with clinicians, epidemiologists and microbiologists, as I have done in this present study to provide contextual and clinical expertise, I was able to apply my knowledge of behavioural theory to explore the needs of clinicians and patients.

Additionally, health psychology can play a critical role in providing an understanding of the underlying behaviours to antibiotic prescribing and consumption, as I have demonstrated in this present research study. By gaining behavioural insights through qualitative research methods, I have been able to apply this insight into developing a behaviour change intervention for use by clinicians and patients which promotes optimal use of antibiotics. From my experience in conducting this research study, I believe that the role of health psychologists in AMR is to work within multidisciplinary teams to gain an understanding of the current context of AMR, apply appropriate research methodologies to gain critical behavioural insights which can then be applied to develop behaviour change interventions.

4.12 Feedback to East Kent and Gloucestershire CCG's

By way of thanks to both regions for willingly disseminating the leaflet and allowing me to use both regions in my study, I have subsequently presented the findings including intervention recommendations to stakeholders in both regions to inform their future implementation and workplans.

On the fifth of November 2019, I presented the research findings to the UTI Countywide Group at Gloucestershire Royal Hospital. Attendees included commissioners, infection prevention nurses, urologists, continence nurses, dieticians and other clinicians from across primary and secondary care. The group were keen to hear the results of this study in order to inform further areas for work in Gloucestershire. Following the presentation, the group agreed that most of the findings confirmed their suspicions of what they felt was current practice in care homes and general practice. Some members were surprised to hear that care home staff were using the leaflet as a personal guide to UTI management, but were pleased to hear that it was considered useful. The group agreed that further education in general practice and care homes would be needed, they have therefore planned to conduct another countywide hydration campaign next summer, using the leaflet.

One group member was surprised to hear that some clinicians were using delayed antibiotics with older adults in the community, to avoid use of unnecessary antibiotics; this prompted a discussion around the appropriateness of delayed antibiotics in this context. The group concluded that

current evidence for delayed antibiotics is weak and therefore inconclusive (Granier, Ahmed, Jones, McNulty, & Butler, 2019) and that further work is needed. The group felt that this should be a further area of work for me and/or Public Health England.

On the 15th of November 2019, I conducted a Skype presentation to a group of East Kent commissioners. Whilst most of the findings confirmed their understanding of current practice in general practice and care homes, interesting discussions ensued. The group agreed with my finding that further education is needed around ASB and the purpose of urinalysis. They believed that the message to not use urine dipsticks should be made explicit, but with the additional caveat 'to diagnose infection', to emphasise that urine dipsticks can still be a useful tool to identify haematuria in men at risk of prostatitis.

Additionally, the group agreed with my recommendation to improve continence regimes in care homes. They believe this should be promoted alongside improved hydration as complementary pieces of work. The group reported proactively promoting hydration, but lacking in improving continence regimes and believe this inaction may be causing inadequate hydration.

The East Kent group are planning to run a local hydration campaign in the summer of 2020 and are hoping to gain national support from Public Health England and NHSE/I with the view of developing a national hydration campaign. The group are keen to see this work published as they want to use the findings from this present study to support the rationale for their work.

4.13 Conclusions

This novel study has provided a detailed insight into the acceptability and feasibility of using the UTI leaflet for older adults and their carers in general practice and care home settings, including current diagnostic and management practices, the variation in implementation, and the barriers and facilitators. Consequently, this study highlights ways to improve the leaflet, implications for successful implementation, and suggestions for ways in which new interventions could overcome the barriers to appropriate UTI diagnosis and management.

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Appendix 1 – Urinary Tract Infections; A leaflet for older adults and carers (A5 booklet)

Public Health England

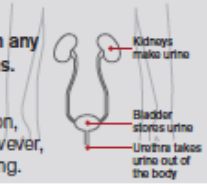
URINARY TRACT INFECTIONS

A leaflet for older adults and carers.

WHAT IS A URINE INFECTION?

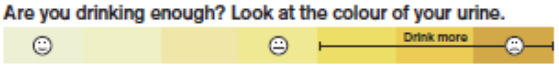
A urine infection occurs when bacteria in any part of the urine system cause symptoms.

If a urine test finds bacteria but you are otherwise well, do not worry, this is common, and antibiotics are not usually needed. However, severe urine infections can be life threatening.



WHAT YOU CAN DO TO HELP PREVENT A URINE INFECTION?

Are you drinking enough? Look at the colour of your urine.



- Drink enough fluid (6-8 glasses) so that you pass pale coloured urine regularly during the day, and to avoid feeling thirsty, especially during hot weather
- Avoid drinking too many fizzy drinks or alcohol
- There is no proven benefit of cranberry products or cystitis sachets
- Prevent constipation. Ask for advice if needed
- Maintain good control of diabetes

Stop bacteria spreading from your bowel into your bladder:

- Wipe genitals from front to back after using the toilet
- Change pads and clean genitals if soiled
- Keep the genital area clean and dry; avoid scented soaps
- Wash with water before and after sex

Speak to your pharmacist about referral to a GP or other treatments.

WHEN SHOULD YOU GET HELP?

The following symptoms are possible signs of serious infection and should be assessed urgently:

Contact your GP Practice or contact NHS 111 (England), NHS 24 (Scotland dial 111), NHS direct (Wales dial 0845 4647), or GP practice (NI)

Shivering, chills and muscle pain

Feeling very confused, drowsy or slurred speech

Not passing urine all day

Temperature is above 38°C or less than 36°C

Trouble breathing

Kidney pain in your back just under the ribs

Visible blood in your urine

Very cold skin

Symptoms are getting a lot worse, or not starting to improve within 2 days of starting antibiotics.

Trust your instincts, ask for advice if you are not sure how urgent the symptoms are.

Developed in collaboration with professional medical bodies. Version 1.3, Published: October 2018, Revision: June 2021

WHAT SIGNS AND SYMPTOMS SHOULD YOU LOOK OUT FOR?

Consider these symptoms if you have a urinary catheter:

- Shivering or shaking
- High or low temperature
- Kidney pain in your back just under the ribs

New or worsening signs of urine infection in all people:

- Pain or burning when passing urine
- High or low temperature
- Shivering or shaking
- Urgency (feeling the need to urinate immediately)
- Pain in your lower tummy above pubic area
- Incontinence (wetting yourself more often than usual)
- Passing urine more often than usual
- Cloudy urine, or visible blood in your urine
- Confusion, change in behaviour, or unsteadiness on feet

ALTHOUGH CONFUSION IS CAUSED BY URINE INFECTION, CONSIDER OTHER THINGS THAT MAY ALSO CAUSE CONFUSION

- Pain
- Constipation
- Poor sleep
- Low mood
- Not drinking enough
- Side effects of medicine
- Other infection
- Change in your routine or home environment
- Poor diet

WHAT CAN YOU DO TO HELP FEEL BETTER?

- Drink enough fluid so that you pass urine regularly during the day, especially during hot weather
- Take paracetamol regularly, up to 4 times daily to relieve fever and pain

- There is no proven benefit of cranberry products or cystitis sachets
- If you're worried about wetting yourself, see your doctor or nurse for advice
- Ask for advice from your pharmacist/carer
- Drink enough fluids to avoid feeling thirsty and to keep your urine pale

WHAT MIGHT YOUR PHARMACIST / NURSE / DOCTOR DO?

- If your symptoms are likely to get better on their own you may receive self-care advice and pain relief
- Ask you to drink more fluids
- Ask you for a urine sample
- You may be given an antibiotic that you can use if your symptoms don't improve or you start to feel worse

ALWAYS TRUST YOUR PHARMACIST'S / NURSE'S / DOCTOR'S ADVICE ABOUT ANTIBIOTICS

- Antibiotics can be life saving for serious urine infections
- But antibiotics are not always needed for urinary symptoms
- Common side effects of taking antibiotics include thrush, rashes, vomiting and diarrhoea; ask for advice if you are worried
- Antibiotics affect the bacteria in your bowel, which may make them resistant to antibiotics for at least a year
- Keep antibiotics working, only take them when your doctor/ nurse advises them

Appendix 2 – Leaflet user guide

Rationale: Why develop a leaflet for UTIs in older frail adults?

Rates of *E. coli* has increased by 6.1% from 2015 – 2017, and 25.6% since 2012/13.[1] The age group with the highest rates of *E. coli* bacteraemia in England were observed amongst older adults[1] On-going mandatory surveillance of *E. coli* bacteraemia has identified 46.9% of cases were most likely due to urinary tract infections (UTIs).[1, 2] By improving knowledge on how to prevent UTIs, how UTIs develop, are diagnosed and managed, self-care advice and advice on when to re-consult, this could reduce recurrent infections and improve older adults' health and wellbeing.

Purpose: Patient satisfaction is more related to having a careful examination and having concerns identified and addressed than to receiving a prescription for antibiotics. This provides a great opportunity to share information with patients and reassure them. We know how busy prescribers are, and how important it is to use precious consultation time efficiently. Therefore, we have developed a leaflet to share with older adults and their relatives or carers when they have urinary symptoms or with those who may be at risk of future UTIs.

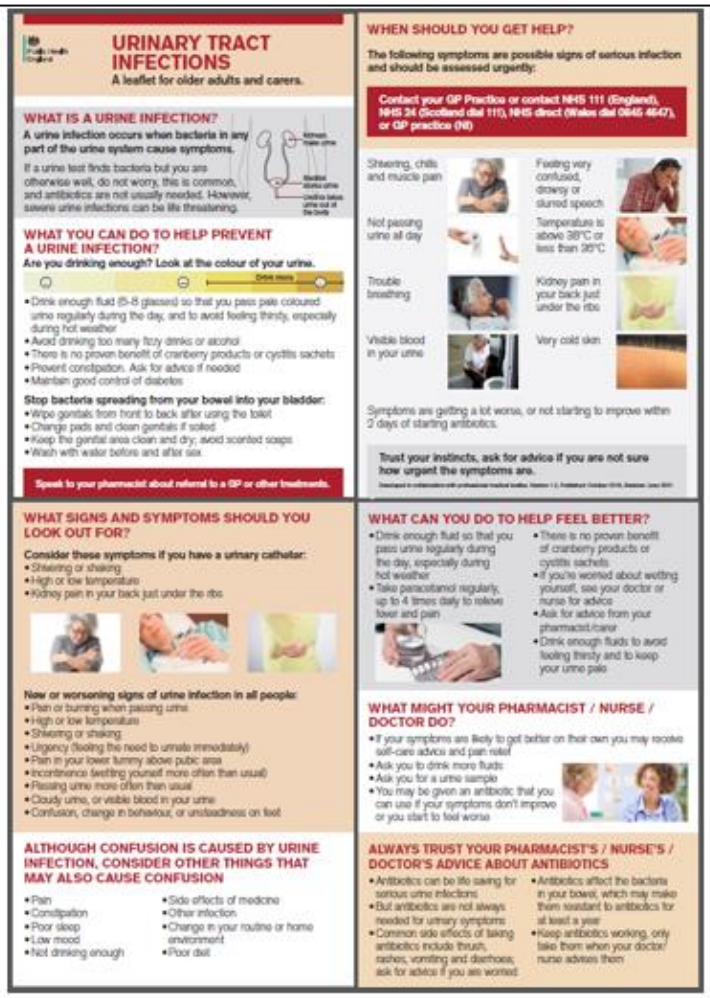
Overview of the TYI-UTI leaflet

Development: The leaflet has been developed following extensive needs assessment with general practitioners, care home staff, care home residents and their relatives, and a variety of stakeholders. The older adult leaflet was developed based on the original TARGET UTI leaflet for uncomplicated UTIs, and underwent iterative modifications after each interview or focus group. Data collection was informed by the Theoretical Domains Framework in order to explore all behavioural determinants.[3]

Use: The leaflet can be used in several ways. To provide information on UTIs to those at risk, care staff may wish to share this leaflet with older adults in their care and/or their relatives. The leaflet may also be used during primary care consultations to facilitate dialogue between a patient and their GP on specific topics like treatment or safety netting.

It is important that the leaflet is used as a tool to interact with patients, rather than as a 'parting gift'. In order to do this effectively you should be familiar with its content.

We are happy to receive feedback about how you have used this leaflet and any constructive comments on how it can be improved. Please contact the TARGET team via email at TARGETantibiotics@phe.gov.uk.



URINARY TRACT INFECTIONS

A leaflet for older adults and carers.

WHAT IS A URINE INFECTION?

A urine infection occurs when bacteria in any part of the urine system cause symptoms.

If a urine test finds bacteria but you are otherwise well, do not worry, this is common, and antibiotics are not usually needed. However, severe urine infections can be life threatening.

WHAT YOU CAN DO TO HELP PREVENT A URINE INFECTION?

Are you drinking enough? Look at the colour of your urine.

- Drink enough fluid (6-8 glasses) so that you pass pale coloured urine regularly during the day, and to avoid feeling thirsty, especially during hot weather
- Avoid drinking too many fizzy drinks or alcohol
- There is no proven benefit of cranberry products or cystitis sachets
- Prevent constipation. Ask for advice if needed
- Maintain good control of diabetes

Stop bacteria spreading from your bowel into your bladder:

- Wipe genitals from front to back after using the toilet
- Change pads and clean genitals if soiled
- Keep the genital area clean and dry; avoid scented soaps
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Speak to your pharmacist about referral to a GP or other treatments.

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Shivering, chills and muscle pain

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Not passing urine all day

Temperature is above 38°C or less than 35°C

Trouble breathing

Kidney pain in your back just under the ribs

Visible blood in your urine

Very cold skin

Symptoms are getting a lot worse, or not starting to improve within 2 days of starting antibiotics.

Trust your instincts, ask for advice if you are not sure how urgent the symptoms are.

WHAT SIGNS AND SYMPTOMS SHOULD YOU LOOK OUT FOR?

Consider these symptoms if you have a urinary catheter:

- Shivering or shaking
- High or low temperature
- Kidney pain in your back just under the ribs

New or worsening signs of urine infection in all people:

- Pain or burning when passing urine
- High or low temperature
- Shivering or shaking
- Urgency (feeling the need to urinate immediately)
- Pain in your lower tummy above pubic area
- Incontinence (wetting yourself more often than usual)
- Passing urine more often than usual
- Cloudy urine, or visible blood in your urine
- Confusion, change in behaviour, or unsteadiness on feet

WHAT CAN YOU DO TO HELP FEEL BETTER?

- Drink enough fluid so that you pass urine regularly during the day, especially during hot weather
- Take paracetamol regularly, up to 4 times daily to relieve fever and pain
- There is no proven benefit of cranberry products or cystitis sachets
- If you're worried about wetting yourself, see your doctor or nurse for advice
- Ask for advice from your pharmacist/carer
- Drink enough fluids to avoid feeling thirsty and to keep your urine pale

WHAT MIGHT YOUR PHARMACIST / NURSE / DOCTOR DO?

- If your symptoms are likely to get better on their own you may receive self-care advice and pain relief
- Ask you to drink more fluids
- Ask you for a urine sample
- You may be given an antibiotic that you can use if your symptoms don't improve or you start to feel worse

ALTHOUGH CONFUSION IS CAUSED BY URINE INFECTION, CONSIDER OTHER THINGS THAT MAY ALSO CAUSE CONFUSION

- Pain
- Constipation
- Poor sleep
- Low mood
- Not drinking enough
- Side effects of medicine
- Other infection
- Change in your routine or home environment
- Poor diet

ALWAYS TRUST YOUR PHARMACIST'S / NURSE'S / DOCTOR'S ADVICE ABOUT ANTIBIOTICS

- Antibiotics can be life saving for serious urine infections
- But antibiotics are not always needed for urinary symptoms
- Common side effects of taking antibiotics include thrush, rashes, vomiting and diarrhoea; ask for advice if you are worried
- Antibiotics affect the bacteria in your bowel, which may make them resistant to antibiotics for at least a year
- Keep antibiotics working, only take them when your doctor/nurse advises them

1. Public Health England. Annual Epidemiological Commentary: Mandatory MRSA, MSSA and E. coli bacteraemia and C. difficile infection data 2016/17. 2017.

2. Public Health England. Health Protection Report; Infection Report. 2016 17th June 2016.

3. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. Implementation Science. 2012;7(37).

Appendix 3 – Referenced leaflet and full reference rationales

Public Health England

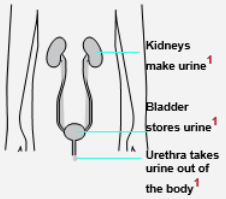
URINARY TRACT INFECTIONS

A leaflet for older adults and carers.

WHAT IS A URINE INFECTION?

A urine infection occurs when bacteria in any part of the urine system cause symptoms.[1,2]

If a urine test finds bacteria but you are otherwise well, do not worry, this is common, and antibiotics are not usually needed.[3,4] However, severe urine infections can be life threatening.[1]



WHAT YOU CAN DO TO HELP PREVENT A URINE INFECTION?

Are you drinking enough? Look at the colour of your urine.[5,6,7]

- Drink enough fluid (6-8 glasses) so that you pass pale coloured urine regularly during the day, and to avoid feeling thirsty, especially during hot weather[5,6,7,8]
- Avoid drinking too many fizzy drinks or alcohol
- There is no proven benefit of cranberry products[9] or cystitis sachets[2]
- Prevent constipation.[10] Ask for advice if needed
- Maintain good control of diabetes

Stop bacteria spreading from your bowel into your bladder:

- Wipe genitals from front to back after using the toilet[11,12]
- Change pads and clean genitals if soiled[11,12]
- Keep the genital area clean and dry;[11,12,13] avoid scented soaps
- Wash with water before and after sex[11,12,13]

Speak to your pharmacist about referral to a GP or other treatments.

TARGET

WHAT SIGNS AND SYMPTOMS SHOULD YOU LOOK OUT FOR?

Consider these symptoms if you have a urinary catheter:

- Shivering or shaking[14]
- High or low temperature[14,16,17]
- Kidney pain in your back just under the ribs[14,16,17]



New or worsening signs of urine infection in all people:

- Pain or burning when passing urine[14,15,16,17]
- High or low temperature[14,15,16,17]
- Shivering or shaking[14,17]
- Urgency (feeling the need to urinate immediately)[14,15,16,17]
- Pain in your lower tummy above pubic area[14,15,16,17]
- Incontinence (wetting yourself more often than usual)[15,17]
- Passing urine more often than usual[14,15,16,17]
- Cloudy urine,[18,19] or visible blood in your urine[14,16,17]
- Confusion, change in behaviour, or unsteadiness on feet[19]

ALTHOUGH CONFUSION IS CAUSED BY URINE INFECTION, CONSIDER OTHER THINGS THAT MAY ALSO CAUSE CONFUSION

- Pain[20,21]
- Constipation[20,8]
- Poor sleep[21,22]
- Low mood[24]
- Not drinking enough[20,23]
- Side effects of medicine[20,23]
- Other infection
- Change in your routine or home environment[20,22]
- Poor diet[23]

WHAT CAN YOU DO TO HELP FEEL BETTER?

- Drink enough fluid so that you pass urine regularly during the day, especially during hot weather
- Take paracetamol regularly, up to 4 times daily to relieve fever and pain[2,26,27]

- There is no proven benefit of cranberry products or cystitis sachets[2,9]
- If you're worried about wetting yourself, see your doctor or nurse for advice[5,6,7,8]
- Ask for advice from your pharmacist/carer
- Drink enough fluids to avoid feeling thirsty and to keep your urine pale

WHAT MIGHT YOUR PHARMACIST / NURSE / DOCTOR DO?

- If your symptoms are likely to get better on their own you may receive self-care advice and pain relief[2,28,29]
- Ask you to drink more fluids[5,6,7,8]
- Ask you for a urine sample[30]
- You may be given an antibiotic that you can use if your symptoms don't improve or you start to feel worse[28,30]

ALWAYS TRUST YOUR PHARMACIST'S / NURSE'S / DOCTOR'S ADVICE ABOUT ANTIBIOTICS

- Antibiotics can be life saving for serious urine infections
- But antibiotics are not always needed for urinary symptoms[31]
- Common side effects of taking antibiotics include thrush, rashes, vomiting and diarrhoea; ask for advice if you are worried[2,29]
- Antibiotics affect the bacteria in your bowel, which may make them resistant to antibiotics for at least a year[32,33]
- Keep antibiotics working, only take them when your doctor/ nurse advises them[31]

WHEN SHOULD YOU GET HELP?

The following symptoms are possible signs of serious infection and should be assessed urgently

Contact your GP Practice or contact NHS 111 (England), NHS 24 (Scotland dial 111), NHS direct (Wales dial 0845 4647), or GP practice (NI)

Shivering, chills and muscle pain[34]

Feeling very confused, drowsy or slurred speech[34,35]

Not passing urine all day[34]

Temperature is above 38ºC or less than 36ºC[35]

Trouble breathing[34,35]

Kidney pain in your back just under the ribs[18]

Visible blood in your urine[14,16,17]

Very cold skin[35]

Symptoms are getting a lot worse, or not starting to improve within 2 days of starting antibiotics.[2,14,36]

Trust your instincts, ask for advice if you are not sure how urgent the symptoms are.

Developed in collaboration with professional medical bodies.
Version: 1.2 Published: October 2018 Review date: June 2021

Section: What is a urine infection?

1. National Institute of Health and Care Excellence (NICE). Urinary tract infections in adults. 2015 Jun. Available from: https://www.nice.org.uk/guidance/qs90/resources/urinary-tract-infections-in-adults-2098962322117.

   RATIONALE: A NICE guideline, stating that **urinary tract infections are caused by the presence and multiplication of micro-organisms in the urinary tract**. This guideline states that urinary tract infections can result in several clinical syndromes, including acute and chronic pyelonephritis (**infection of the kidney** and renal pelvis), cystitis (**infection of the bladder**), urethritis (**infection of the urethra**), epididymitis (infection of the epididymis), and prostatitis (infection of the prostate gland). **A urinary tract infection is defined by a combination of clinical features and the presence of bacteria in the urine**.

2. National Institute for Health and Care Excellence Urinary tract infection (lower): antimicrobial prescribing. NICE Guideline 2018. Available from: https://www.nice.org.uk/guidance/ng109.

   RATIONALE: A NICE guideline, **stating that lower UTI is an infection of the bladder usually caused by bacteria from the gastrointestinal tract entering the urethra and travelling up to the bladder**.

   The guideline also recommends to give **advice about managing symptoms with self-care such as by using paracetamol, and that there are possible adverse effects of using antibiotics such as diarrhoea and nausea.**

   Additionally, the guideline advises to **seek medical help if symptoms worsen rapidly or do not start to improve within 48 hours of taking an antibiotic.**

3. Abrutyn E, Mossey J, Berlin JA, Boscia J, Levison M, Pitsakis P et al. Does asymptomatic bacteriuria predict mortality and does antimicrobial treatment reduce mortality in elderly ambulatory women: Ann Intern Med. 1994 May; 120(10):827-833. Available from: https://www.ncbi.nlm.nih.gov/pubmed/7818631.

   RATIONALE: A cohort study and a controlled clinical trial of non-catheterised older women examining the effect of antimicrobial treatment, conducted in a geriatric centre and 21 continuing care retirement communities. Urine cultures were taken every 6 months and comorbidity and mortality were monitored. Infected residents (n = 318) were older, and sicker, and had higher mortality (18.7 per 100 000 resident-days) than uninfected residents (n = 1173; 10.1 per 100 000 resident-days). However, **infection was not related to mortality** whereas age at entry and self-rated health were strong predictors. Urinary tract infection was not an independent risk factor for mortality, and its **treatment did not lower the**

mortality rate. Authors concluded that **screening and treatment of asymptomatic bacteriuria in ambulatory elderly women to decrease mortality does not appear to be warranted.**

4. Nicolle LE, Mayhew WJ, Bryan L. Prospective randomized comparison of therapy and no therapy for asymptomatic bacteriuria in institutionalized elderly women. Am J Med. 1987 Jul; 83(1):27-33. Available from: https://www.ncbi.nlm.nih.gov/pubmed/3300325.

   RATIONALE: Fifty older institutionalised women with asymptomatic bacteriuria were randomly assigned either to receive therapy for treatment of all episodes of bacteriuria identified on monthly culture or to receive no therapy unless symptoms developed. Subjects were followed for one year. The therapy group had a mean monthly prevalence of bacteriuria 31 ± 15 percent lower than those in the no-therapy group. For residents receiving no therapy, 71 percent showed persistent infection with the same organism(s). Antimicrobial therapy was associated with an increased incidence of reinfection and adverse antimicrobial drug effects as well as isolation of increasingly resistant organisms in recurrent infection when compared with no therapy. **No differences in genitourinary morbidity or mortality were observed between the groups**. Thus, despite a lowered prevalence of bacteriuria, **no short-term benefits were identified and some harmful effects were observed with treatment of asymptomatic bacteriuria. These data support current recommendations of no therapy for asymptomatic bacteriuria in this population**

Section: What can you do to help prevent a urine infection?

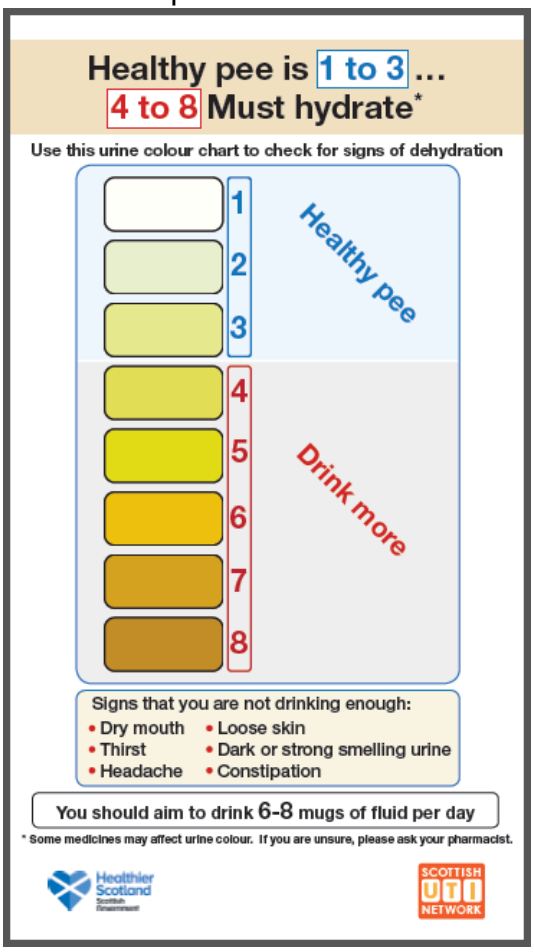
There is limited research clearly identifying linkages between lifestyle behaviours and urinary tract infections. Findings from the needs assessment indicate that patients wanted information on what they could do to prevent urine infections as they felt this was important to lessen their chances of developing a UTI.

"I think it's really helpful, I do. Because it gives you advice about how to prevent it and what to do when,… I think if you can lessen the chances of getting a UTI then that's really important so like you were saying about keeping yourself clean and things like that and using non perfumed soaps and all that sort of stuff."

Through needs assessment work and expert consensus we have provided some recommendations for lifestyle behaviours that may prevent urine infections and support overall health and wellbeing. See available research below:

5. Scottish UTI Network. Healthy pee is 1 to 3 … 4 to 8 Must hydrate. In: Health Protection Scotland, ed2017. Available from: http://www.hps.scot.nhs.uk/haiic/sutin.aspx

RATIONAL: The Scottish UTI Network developed their own urine colour chart and gave us permission to replicate it in this leaflet.



6. Kavouras SA. Assessing hydration status. *Current Opinion in Clinical Nutrition and Metabolic Care*. 2002;5(5):519-524. Available from: https://www.ncbi.nlm.nih.gov/pubmed/12172475

   RATIONALE: A literature review to examine the available techniques in assessing hydration status. The author concludes that **urine colour in most circumstances reflects the level of hydration** and is closely related to several urinary and plasma indices of hydration. Although, urine colour can be influenced by diet, drugs and illness.

7. Armstrong LE, Maresh CM, Castellani JW, et al. Urinary Indices of Hydration Status. International Journal of Sport Nutrition. 1994;4(3):265 - 279. Available from: http://journals.humankinetics.com/doi/pdf/10.1123/ijsn.4.3.265

   RATIONALE: Attempting to simplify the analysis of urine, Professor Armstrong oversaw a series of experiments, beginning in 1994, testing the validity of a numbered urine colour chart. The logic underlying the first study **(1) proposed that virtually anyone could determine her/his hydration state, if urine colour were directly proportional to the gain or loss of body water**. The initial laboratory study involved developing a **numbered scale of colours ranging from very pale yellow (number 1) to brownish**

green (number 8). This research demonstrated that urine colour likely would be useful and effective during daily activities, exercise, and heavy labour.

ScienceDaily. Women who get frequent UTIs may reduce risk by drinking plenty of water. 2017; https://www.sciencedaily.com/releases/2017/10/171005190252.htm. Accessed 15/02, 2018.

8. Beetz R. Mild dehydration: a risk factor of urinary tract infection? Eur J Clin Nutr. 2003;57 Suppl 2:S52-58. Available from: https://www.ncbi.nlm.nih.gov/pubmed/14681714

   RATIONALE: A review of the literature. The discussion pertains to bacterial eradication from the urinary tract being partially dependent on urine flow and voiding frequency. **The authors postulate a connection between fluid intake and the risk of UTIs. However, experimental and clinical data on this subject are conflicting.** Experimental studies concerning the effect of water intake on susceptibility and course of UTIs were predominantly performed in the 60 s and 70 s. Despite many open questions, there has been no continuous research in this field. Only few clinical studies producing contradictory results are available on the influence of fluid intake concerning the risk of UTI. One explanation for the inconsistency between the data might be the uncertainty about the exact amounts of fluid intake, which was mostly recorded in questionnaires. So far, there is no definitive evidence that the susceptibility for UTI is dependent on fluid intake. **Nevertheless, adequate hydration is important and may improve the results of antimicrobial therapy in UTI.** Results of experimental and clinical studies concerning urinary hydrodynamics are the basis for **advice given by expert committees to patients with UTI to drink large volumes of fluid, void frequently, and completely empty the bladder**. The combination of the behaviourally determined aspects of host defence and not simply increasing fluid intake is important in therapy and prophylaxis of UTI.

   Included in the leaflet is the recommendation to remain hydrated as this is felt to be important to prevent dehydration, improve results for any antimicrobial therapy, to ensure frequent voiding and to prevent constipation.

   ScienceDaily. Women who get frequent UTIs may reduce risk by drinking plenty of water. 2017; https://www.sciencedaily.com/releases/2017/10/171005190252.htm. Accessed 15/02, 2018.

9. Jepson RG, Williams G, Craig JC Cranberries for preventing urinary tract infections. Cochrane Database Syst Rev 2012; 10: CD001321. Available from: http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD001321.pub5/epdf

RATIONALE: Data included in the meta-analyses showed that, compared with placebo, water or no treatment, cranberry products did not significantly reduce the occurrence of symptomatic UTI in **Older people: (RR 0.75, 95% CI 0.39 to 1.44).** Many studies reported low compliance and high withdrawal/dropout problems which they attributed to palatability/acceptability of the products, primarily the cranberry juice. Most studies of other cranberry products (tablets and capsules) did not report how much of the 'active' ingredient the product contained, and therefore the products may not have had enough potency to be effective. It is for this reason that we do not recommend use of cranberry products in the leaflet.

10. Characha G, Greensteinb A, Rabinovicha P, Groskopfa I, Weintrauba M. Alleviating Constipation in the Elderly Improves Lower Urinary Tract Symptoms. Gerontology. 2000;47:72-76. Available from: https://www.ncbi.nlm.nih.gov/pubmed/11287730

RATIONALE: Prospective cohort study of fifty-two patients aged 65-89 years with chronic constipation and lower urinary tract symptoms (LUTS). Before treatment of constipation was initiated and on their monthly visits, patients completed a questionnaire regarding their constipation pattern, urinary symptoms, sexual function and mood, and underwent urinalysis. Urinary tract anatomy and residual urine were evaluated by abdominal ultrasound at the commencement and completion of the study. Patients were followed up for 4 months. **Fewer patients reported urgency, frequency and burning sensation during urination.** Urinary stream disturbances improved in 32 of the 52 patients. Residual urine volume also significantly decreased. There was also a **significant decrease in the number of patients with bacteriurial events** and an improvement in sexual activity and mood.

Included in the leaflet is the recommendation to drink plenty of fluids and to prevent constipation as this may reduce urinary symptoms.

11. Amiri FN, Rooshan MH, Ahmady MH, Soliamani MJ. Hygiene practices and sexual activity associated with urinary tract infection in pregnant women. Eastern Mediterranean Health Journal. 2009;15(1). Available from: http://apps.who.int/iris/bitstream/10665/117613/1/15_1_2009_0104_0110.pdf

RATIONALE: This study is in younger pregnant women but results showing that poorer hygiene is associated with UTIs may be transferable to older

adults. This is a case–control study to determine the association of urinary tract infection (UTI) with genital hygiene practices and sexual activity in pregnant women attending prenatal clinics in Babol, Islamic Republic of Iran. A sample of 100 pregnant women with positive urine cultures (cases) were compared with 150 healthy pregnant women matched for age, social, economic and education status and parity(controls). Factors associated with UTI included sexual intercourse ≥ 3 times per week (OR = 5.62), recent UTI (OR = 3.27), **not washing genitals precoitus (OR = 2.16), not washing genitals postcoitus (OR = 2.89)** not voiding urine postcoitus (OR = 8.62) **and washing genitals from back to front (OR = 2.96). Low intake of fluids and voluntary urinary retention** were associated with UTI in women in this study.

12. Scholes D, Hooton TM, Roberts PL, Stapleton AE, Gupta K, Stamm WE. Risk factors for recurrent urinary tract infections in young women. *J Infect Dis*. 2000 Oct; 182(4):1177-1182. Available from: https://www.ncbi.nlm.nih.gov/pubmed/10979915.

    RATIONALE: This study is not in older women but the results could be transferable to an older sample. A case-control study of two populations in Seattle (USA), in which 229 university women and female health maintenance organisation enrolees with recurrent urinary tract infections were recruited. Independent risk factors for recurrent UTIs included: **intercourse frequency within the previous month without washing** (OR 5.8; 95% CI 3.1 to 10.6); spermicide use in the last 12 months (OR 1.8; 95% CI 1.1 to 2.9); new sexual partner during the past year (OR 1.9; 95% CI 1.2 to 3.2). Advice is given on how to prevent recurrent UTIs, including: **voiding after intercourse; increased fluid intake;** avoiding use of condoms with spermicide-coated lubricants. Noted were a few differences between case patients and control subjects in a wide variety of other behavioural exposures that have been reported or proposed as risk factors for RUTI. **These included pre- and postcoital voiding,** frequency of urination, **wiping patterns**, douching, use of hot tubs, frequent use of pantyhose or tights, and others.

    This reference is used to support the use of good hygiene practices when caring for genitals in order to prevent UTI.

13. Moore EE, Hawes SE, Scholes D, Boyko EJ, Hughes JP, Fihn SD. Sexual Intercourse and Risk of Symptomatic Urinary Tract Infection in Post-Menopausal Women. Journal of General Internal Medicine. 2008;23(5):595-599. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2324148/

    RATIONALE: A 2-year, prospective, observational study of post-menopausal women to determine whether recent sexual intercourse, as documented by daily diaries, is associated with an increased risk of

symptomatic UTI. One thousand and seventeen randomly selected post-menopausal women were enrolled. Women were asked to enter daily diary information on vaginal intercourse, medication use, and genito-urinary symptoms. The outcome of interest was symptomatic UTI. Of the 913 women, seventy-eight experienced 108 symptomatic UTIs, and 361 (40%) reported sexual intercourse in their diaries. **There was an increased hazard for UTI 2 calendar days after the reporting of sexual intercourse in the diaries** (adjusted hazard ratio [HR], 3.42, 95% CI 1.49–7.80), while there was no evidence for an increased hazard associated with intercourse at other times. When the UTI criterion was relaxed from _105 CFU/mL to _104 CFU/mL, adding 9 UTI events to the analysis, the HR for UTI 2 days after intercourse changed slightly to 3.26 (95% CI 1.43–7.43). This evidence suggests that, as with younger women, **recent sexual intercourse is strongly associated with incident UT**I in generally healthy post-menopausal women. This study was not aimed at preventing UTI but does show that recent sexual intercourse in older women is associated with increased UTIs and therefore improved sexual hygiene may help in this group.

Section: If you have any of these symptoms seek advice from your pharmacist, nurse or doctor

14. Scottish Intercollegiate Guidelines Network (SIGN). Management of bacterial urinary tract infection in adults. 2012 Jul. Available from: http://www.sign.ac.uk/assets/sign88.pdf.

    RATIONALE: A SIGN guideline, outlining symptoms of bacterial urinary tract infections as: **dysuria; frequency of urination; suprapubic tenderness; urgency; polyuria; haematuria.** Expert consensus is that, in women with symptoms of vaginal itch or discharge, alternative diagnoses to UTI should be explored. This guideline also provides details of UTI symptoms suggestive of pyelonephritis, including: **loin pain; flank tenderness; fever; rigors; other manifestations of systemic inflammatory response**, and suggests admission to hospital if there is no response to antibiotic treatment within 24 hours.

15. Arinzon Z, Shabat S, Peisakh A, Berner Y. Clinical presentation of urinary tract infection (UTI) differs with aging in women. Archives of Gerontology and Geriatrics. 2011 Oct, 55(2012:) 145–147. Available from: http://www.sciencedirect.com/science/article/pii/S0167494311002202?via%3Dihub

    RATIONALE: An observational study of women over the age of 45 from a community clinic with confirmed UTI. Women who presented with urinary

symptoms were divided into 2 age groups (45-54 years, n = 102, mean age 48.14 years and > 65 years n = 94, mean age 69.21 years). To obtain a homogeneous group, women aged 55-64 were excluded. Those with a confirmed UTI (>103cfu/ml of an uropathogen in midstream urine culture) were asked questions related to demographics, behaviours, medical history and symptoms. **There was a positive correlation between being older and reporting urine urgency, painful voiding, incontinence, low back-pain, and lower abdominal pain**. Frequency, painful and burning urination and bladder pain was reported less with the older age group (though still reported). **Older women reported more generalized unspecific symptoms (lower abdominal pain, lower back pain, chills, constipation, and diarrhoea) and incontinence issues**. The study indicates that clinical presentation of UTI in older and younger (study specified pre and post-menopausal) women is slightly different. **The differences are presented not only by the voiding itself and by local symptoms but also by unspecified generalized symptoms that is especially important in older patients.**

16. Chu CM. Diagnosis and Treatment of Urinary Tract Infections Across Age Groups. American Journal of Obstetrics and Gynecology. 2018. Available from: http://www.ajog.org/article/S0002-9378(17)32805-3/pdf

    RATIONALE: An expert review of diagnosis and treatments of UTIs in different age groups. Authors suggest that the most diagnostic symptoms of urinary tract infections include change in **frequency, dysuria, urgency,** and presence or absence of vaginal discharge, but suggest that **urinary tract infections may present differently in older women**. Other symptoms include **suprapubic, vaginal, and urethral tenderness, as well as haematuria**. It is important to note that systemic symptoms, such as **nausea, vomiting, flank pain, upper back pain, and fevers may indicate ascension of infection to the upper urinary tract and should not be treated as uncomplicated UTI.**

17. Loeb M, Brazil K, Lohfeld L, McGeer A, Simor A, Stevenson K et al. Effect of a multifaceted intervention on number of antimicrobial prescriptions for suspected urinary tract infections in residents of nursing homes: cluster randomised controlled trial. *BMJ*. 2005 Sep; 331(7518):669. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1226247/.

    RATIONALE: A cluster randomised controlled trial in 24 nursing homes in Ontario, Canada, and Idaho, United States, with 12 allocated to a multifaceted intervention, and 12 allocated to usual care. A diagnostic and treatment algorithm was implemented in the multifaceted intervention,

suggesting that urine cultures should only be ordered if there is a **fever of >37.9°C, or a 1.5°C increase** above baseline on at least two occasions over the previous 12 hours, and one or more of the following: **dysuria; urinary catheter; urgency; flank pain; shaking chills; urinary incontinence; frequency; gross haematuria; suprapubic pain.** Antibiotics should only be prescribed on a positive or pending culture (>10^5 CFU/mL). Fewer courses of antimicrobials were prescribed in the intervention nursing homes than in the usual care homes (weighted mean difference -0.49; 95% CI -0.93 to -0.06). The difference in total antimicrobial use between intervention and usual care groups was not significantly different (weighted mean difference -0.37; 95% CI -1.17 to 0.44). A multifaceted intervention using algorithms can reduce the number of antimicrobial prescriptions for UTIs in residents of nursing homes.

This algorithm is widely used and is a generally accepted tool for diagnosing and treating UTI. It is for this reason that the clinical features referred to in this algorithm have been highlighted in the leaflet.

18. Massa LM, Hoffman JM, Cardenas DD. Validity, Accuracy, and Predictive Value of Urinary Tract Infection Signs and Symptoms in Individuals With Spinal Cord Injury on Intermittent Catheterization. The Journal of Spinal Cord Medicine. 2016;32(5):568-573. Available from: https://www.ncbi.nlm.nih.gov/pubmed/20025153

    RATIONALE: A prospective cohort based on data from the first 3 months of a 1-year randomized controlled trial to evaluate UTI prevention effectiveness of hydrophilic and standard catheters on fifty-six community-based individuals on intermittent catheterization (IC). Analysis of monthly urine culture and urinalysis data combined with analysis of monthly data collected using a questionnaire that asked subjects to self-report on UTI signs and symptoms and whether or not they felt they had a UTI. Overall, **"cloudy urine" had the highest accuracy** (83.1%), and second highest positive predictive value (61.3%) and sensitivity (65.5%). **"Foul smell in urine" had the second highest accuracy** (79.2%) and the third best sensitivity (48.3%).

19. Juthani-Mehta M, Quagliarello V, Perrelli E, Towle V, Van Ness PH, Tinetti M. Clinical features to identify urinary tract infection in nursing home residents: a cohort study. J Am Geriatr Soc. 2009;57(6):963-970. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2692075/pdf/nihms97952.pdf

    RATIONALE: A prospective, observational cohort study conducted in five nursing homes. 551 nursing home residents were followed for one year for the development of clinically suspected UTI. Measurements included the combined outcome of bacteriuria (>100,000 colony forming units on urine culture) plus pyuria (>10 white blood cells on urinalysis). After 178,914

person-days of follow-up, 228 participants had 399 episodes of clinically suspected UTI with a urinalysis and urine culture performed; 147 episodes (37%) had bacteriuria plus pyuria. The clinical **features associated with bacteriuria plus pyuria were dysuria, change in character of urine, and change in mental status.** Absence of these clinical features identified residents at low risk of having bacteriuria plus pyuria (25%), while presence of dysuria plus one or both of the other clinical features identified residents at high risk of having bacteriuria plus pyuria (63%).

This study highlights the importance of altered mental state (confusion) and urine characteristics (odour and colour) in identifying UTI, hence their inclusion in the leaflet.

Section: Although confusion is caused by urine infection consider other things that may also cause confusion

20. Pryor C, Clarke A. Nursing care for people with delirium superimposed on dementia. Nurs Older People. 2017;29(3):18-21.Available from: http://nrl.northumbria.ac.uk/30550/1/PryorAAM.pdf

RATIONALE: This review describes a simple mnemonic called PINCH ME **(Pain, INfection, Constipation, deHydration, Medication, Environment) which can help identify potential underlying causes of delirium superimposed on dementia (DSD)** and considerations for care planning in patients with dementia. The mnemonic can easily be adapted to different clinical settings. This article explores the dichotomy in healthcare provision for 'physical' and 'mental' health, and the unique role nurses have when caring for people with DSD. In this article, dementia is contrasted with delirium and subtypes of delirium presentation are discussed. Nurses can recognise DSD through history gathering, implementation of appropriate care and effective communication with families and the multidisciplinary team.

Several members of the leaflet development steering group use the PINCH ME mnemonic in their clinical practice. Participants of the needs assessment (Carers and GP staff) reported it was very useful and reflected their own practice and experience of patients with confusion.

21. Siddiqi N, Harrison JK, Clegg A, et al. Interventions for preventing delirium in hospitalised non-ICU patients. Cochrane Database Syst Rev. 2016;3:CD005563. Available from: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD005563.pub3/abstract

RATIONALE: A systematic review to assess the effectiveness of interventions for preventing delirium in hospitalised non-Intensive Care Unit (ICU) patients. This review suggests that **lack of sleep and pain are important risk factors for delirium** although this was not the focus of the review.

22. Young J, Inouye SK. Delirium in older people. BMJ. 2007;334(7598):842-846. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1853193/pdf/bmj-334-7598-cr-00842.pdf
RATIONALE: A clinical review of delirium in older adults that demonstrates that the following are risk factors and precipitators of delirium: **Old age (over 65 years), physical frailty, severe illness, multiple diseases, dementia, admission to hospital with infection or dehydration, visual impairment, deafness, polypharmacy, alcohol excess, renal impairment, malnutrition Precipitants (more than one may be present) Lower respiratory tract infection, urinary infection/catheters, constipation, electrolyte disturbance (dehydration, renal failure, hyponatraemia or hypernatraemia), drugs (especially those with anticholinergic activity or psychoactive drugs), alcohol withdrawal, pain, neurological disorder (stroke, epilepsy, subdural haematoma), hypoxia, sleep deprivation, surgery (such as fractured neck of femur), environmental**. Medline and the Cochrane Library were searched from1996 to 2006. Additional material from personal libraries of delirium references, focusing particularly
on systematic reviews were also included.

23. Ahmed S, Leurent B, Sampson EL. Risk factors for incident delirium among older people in acute hospital medical units: a systematic review and meta-analysis. Age Ageing. 2014;43(3):326-333. Available from: https://academic.oup.com/ageing/article/43/3/326/17725
RATIONALE: A systematic review and meta-analysis of eleven articles. Total study population 2338 (411 patients with delirium/1927 controls). **The commonest factors significantly associated with delirium were dementia, older age, co-morbid illness, severity of medical illness, infection, 'high-risk' medication use, diminished activities of daily living, immobility, sensory impairment, urinary catheterisation, urea and electrolyte imbalance and malnutrition.** In pooled analyses, dementia (OR 6.62; 95% CI (confidence interval) 4.30, 10.19), illness severity (APACHE II) (MD (mean difference) 3.91; 95% CI 2.22, 5.59), visual impairment (OR 1.89; 95% CI 1.03, 3.47), urinary catheterisation (OR 3.16; 95% CI 1.26, 7.92), low albumin level (MD −3.14; 95% CI −5.99, −0.29) and length of hospital stay (OR 4.85; 95% CI 2.20, 7.50) were statistically significantly associated with delirium.

24. Inouye SK. Delirium in Older Persons. The new england journal of medicine. 2006;354(11): 1157-1165. Available from: http://www.nejm.org/doi/pdf/10.1056/NEJMra052321

RATIONALE: A review article of delirium in older adults that demonstrates that **low mood and other emotional disturbances** can be a symptom or sign of delirium.

25. Inouye SK. Predisposing and Precipitating Factors for Delirium in Hospitalized Older Patients. Dement Geriatr Cogn Disord. 1999;10:393–400. Available from: https://www.ncbi.nlm.nih.gov/pubmed/10473946

RATIONALE: This investigation proposes a multifactorial model of delirium aetiology, involving a complex interrelationship of predisposing (vulnerability) factors and precipitating factors (acute insults). An overview of risk factors for delirium identified in 14 studies published since 1980 is provided. Although these studies identify key risk factors for delirium, they do not allow the examination of the interrelationship of predisposing and precipitating factors. Thus, presented are two prospective cohort studies which empirically examine: (1) predisposing (vulnerability) factors, (2) precipitating factors, and (3) the interrelationship of predisposing and precipitating factors. 3 of the studies examined in this review identified **dehydration as a risk factor for delirium**. Other risk factors identified include **cognitive impairment, older age, psychoactive drug use, severe illness/comorbidity, azotemia/dehydration, male gender, alcohol abuse, infection/fever, metabolic abnormality**.

Section: What can you do to help feel better?

26. Little P. Antibiotics or NSAIDs for uncomplicated urinary tract infection? BMJ. 2017;359:j5037. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29117972

RATIONALE: An editorial discussion around antibiotics or NSAID's for UTIs. The author suggests **Paracetamol could be used more regularly as the first line analgesic in UTIs** as it seems to be associated with a lower risk of adverse outcomes compared to nonsteroidal anti-inflammatories. The authors conclude however, that more evidence is needed to support the use of paracetamol in treating UTIs.

27. Kronenberg A, Butikofer L, Odutayo A, et al. Symptomatic treatment of uncomplicated lower urinary tract infections in the ambulatory setting: randomised, double blind trial. BMJ. 2017;359:j4784. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29113968

RATIONALE: PHE decided to not include Ibuprofen as a recommended self-care treatment for older adults with UTI, due to the increased risk of

pyelonephritis in this study with NSAID. However, there may be a place for the use of NSAIDs for pain relief with antibiotics but more studies are needed to establish any risks from this. This study is a Randomised, double blind, non-inferiority trial in 17 general practices in Switzerland. 253 women with uncomplicated lower UTI were randomly assigned 1:1 to symptomatic treatment with the NSAID diclofenac (n=133) or antibiotic treatment with norfloxacin (n=120). The primary outcome was resolution of symptoms at day 3 (72 hours after randomisation and 12 hours after intake of the last study drug). The prespecified principal secondary outcome was the use of any antibiotic (including norfloxacin and fosfomycin as trial drugs) up to day 30. Analysis was by intention to treat. Six women in the diclofenac group (5%) but none in the norfloxacin group received a clinical diagnosis of pyelonephritis (P=0.03). **Diclofenac is inferior to norfloxacin for symptom relief of UTI and is likely to be associated with an increased risk of pyelonephritis,** even though it reduces antibiotic use in women with uncomplicated lower UTI.

The steering group felt strongly that Iburprofen should not be recommended as a self-care pain relief due to the risk of pyelonephritis identified in this study.

Section: What might your pharmacist/nurse/doctor do?

28. Public Health England. National Antibiotic Management Guidance: The TARGET Antibiotics Toolkit. 2012; Available from: https://www.gov.uk/government/publications/managing-common-infections-guidance-for-primary-care

    RATIONALE: The guidance states: 'As antibiotic resistance and Escherichia coli bacteraemia in the community is increasing, **use nitrofurantoin first line, always give safety net and self-care advice, and consider risks for resistance'**

29. Leydon GM, Turner S, Smith H, Little P, UTIS Team. Women's views about management and cause of urinary tract infection: qualitative interview study. *BMJ*. 2010 Feb; 5(340):1-7. Available from: http://www.bmj.com/content/bmj/340/bmj.c279.full.pdf

    RATIONALE: A retrospective study, aiming to explore the views of women with urinary tract infections on the acceptability of different strategies for managing the infection, including delayed use of antibiotics, and the cause of infection. 21 women presenting to general practices across Southern England were included. **Results indicated that women preferred not to take antibiotics, and were open to alternative management**

approaches, due to wanting to avoid the side-effects of antibiotic therapy. Most of the participants with experience of antibiotic use had developed **thrush, skin rash, and gastrointestinal side-effects as a consequence,** and this mediated their desire for antibiotic medication. **The authors conclude that if women are asked to delay taking antibiotics, the clinician must address the particular worries that women might have, and explain the rationale for not using antibiotics immediately. Safety netting is important if this strategy is used.**

30. Public Health England. Urinary tract infection: diagnosis guide for primary care. Gov.uk 2017. Available from: https://www.gov.uk/government/publications/urinary-tract-infection-diagnosis
    RATIONALE: Guidance for primary care on diagnosing and understanding culture results for urinary tract infection (UTI). The guidance states **'Only send urine for culture if two or more signs of infection, especially dysuria, fever >38°C, or new incontinence'** and 'treat with first line agents if UTI probable'.

Section: Always trust your pharmacist's/nurse's/doctor's advice about antibiotics

31. National Institute for Health and Care Excellence. Antimicrobial stewardship: changing risk related behaviours in the general population. 2017. Available from: https://www.nice.org.uk/guidance/ng63/resources/antimicrobial-stewardship-changing-riskrelated-behaviours-in-the-general-population-pdf-1837572082117
    RATIONALE: This guideline covers making people aware of how to correctly use antimicrobial medicines (including antibiotics) and the dangers associated with their overuse and misuse. It also includes measures to prevent and control infection that can stop people needing antimicrobials or spreading infection to others**. It aims to change people's behaviour to reduce antimicrobial resistance and the spread of resistant microbes**. The guideline also includes the importance of self-care advice for the general public.

32. Costelloe C, Metcalfe C, Lovering A, Mant D, Hay AD. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients – systematic review and meta-analysis. *BMJ*. 2010 May; 18(340):1-11. Available from: http://www.bmj.com/content/bmj/340/bmj.c2096.full.pdf
    RATIONALE: A systematic review and meta-analysis, aiming to investigate subsequent antibiotic resistance in individuals prescribed antibiotics in

primary care. 24 studies were included, 22 of which involved patients with symptomatic infection, and two of which involved healthy volunteers. In five studies of urinary tract bacteria (14,348 participants), the pooled odds ratio for resistance was 2.5 (95% CI 2.1 to 2.9) within two months of antibiotic treatment, and 1.33 (95% CI 1.2 to 1.5) within 12 months. Studies reporting the quantity of antibiotic prescribed found that **longer duration and multiple courses were associated with higher rates of resistance.** The authors conclude that individuals prescribed an antibiotic in primary care for a urinary infection develop bacterial resistance to that antibiotic. **The effect is greatest in the month immediately following treatment, but may persist for up to 12 months.** This effect not only increases the population carriage of organisms resistant to first line antibiotics, **but also creates the conditions for increased use of second-line antibiotics in the community.**

33. Alanis AJ. Resistance to antibiotics: are we in the post-antibiotic era? *Arch Med Res*. 2005 Dec; 36(6):697-705. Available from: http://www.sciencedirect.com/science/article/pii/S0188440905002730.
    RATIONALE: A review article, stating that serious infections caused by bacteria that have become resistant to commonly used antibiotics have become a major global healthcare problem in the 21st century. This review states that the single largest cause of antibiotic resistance is the indiscriminate and inappropriate use of antibiotics in outpatient clinics, hospitalised patients, and in the food industry. **The authors state that antibiotics should only be taken on advice from a healthcare professional** for a bacterial infection that shows susceptibility to that particular antibiotic. This review also states that new mechanisms of resistance have resulted in the simultaneous development of resistance to several antibiotic classes, creating very dangerous multidrug-resistant bacterial strains, also known as 'super-bugs'. The potential negative consequences of this are that they put society at risk for the spread of potentially serious multi-drug resistant bacterial infections.

Section: When should you get help?

34. The UK Sepsis Trust. Do I have sepsis? 2016 Mar. Available from: https://sepsistrust.org/news/what-is-sepsis/.
    RATIONALE: A UK Sepsis Trust website. The website states that if someone has early signs of a **flu-like illness, chest infection, diarrhoea and vomiting, or an inability to eat and drink,** together with one of the symptoms of sepsis, immediate medical advice should be sought. This

website defines the symptoms of sepsis as: **slurred speech; extreme shivering or muscle pain; passing no urine (in a day); severe breathlessness; skin mottled or discoloured.**

35. National Institute of Health and Care Excellence (NICE). Sepsis: Recognition, diagnosis and early management. 2016 Jul. Available from: https://www.nice.org.uk/guidance/ng51/resources/sepsis-recognition-diagnosis-and-early-management-1837508256709.

    RATIONALE: A NICE guideline for health care staff, stating that people with sepsis may have non-specific, non-localised presentations, such as feeling generally unwell without a high temperature of over 38°C. This guideline presents a risk stratification tool for adults, children and young people aged 12 years and over with suspected sepsis. Where high temperature is recognised as a cause for concern, this guideline also lists **a tympanic temperature of less than 36°C as a moderate to high risk criteria for sepsis** along with objective evidence of **new altered mental state, respiratory rate of 25 breaths per minute or above, or new need for 40% oxygen or more to maintain oxygen saturation more than 92% (or more than 88% in known chronic obstructive pulmonary disease)** heart rate of more than 130 beats per minute systolic blood pressure of 90 mmHg or less, or systolic blood pressure more than 40 mmHg below normal **not passed urine in previous 18 hours (for catheterised patients, passed less than 0.5 ml/kg/hour) mottled or ashen appearance cyanosis of the skin, lips or tongue non-blanching rash of the skin.**

36. Little P, Turner S, Rumsby K, Warner G, Moore M, Lowes JA et al. Dipsticks and diagnostic algorithms in urinary tract infection: development and validation, randomised trial, economic analysis, observational cohort and qualitative study. *Health Technol Assess*. 2009 Mar; 13(19):1-73. Available from: https://www.ncbi.nlm.nih.gov/pubmed/19364448.

    RATIONALE: A collation of six studies, aiming to estimate clinical and dipstick predictors of infection and develop and test clinical scores, and to compare management using clinical and dipstick scores with commonly used alternative strategies. The results showed that, in women with uncomplicated UTI, the negative predictive value when nitrite, leukocytes, and blood are all negative was 76%. The positive predictive value for having nitrite and either blood or leukocytes was 92%. Moderate to severe UTI is defined as having a higher symptom score of two or more of: urine cloudiness; smell; nocturia; dysuria. **Results also suggested that women suffer 3.5 days of moderately bad symptoms with immediate antibiotics, and 4.8 days if taking antibiotics is delayed for 48 hours.** The authors conclude that, to achieve good symptom control and reduce antibiotic use, clinicians should either offer a 48-hour delayed antibiotic prescription to be used at the patient's discretion, or target antibiotic treatment by dipsticks (positive nitrite or positive leukocytes and blood) with

the offer of a delayed prescription if dipstick results are negative. **Those treated with empirical therapy should, however, seek further advice if their symptoms do not start to improve within 48 hours.**

Additional reading – papers not cited in the leaflet

37. Kranjcec B, Papes D, Altarac S. D-mannose powder for prophylaxis of recurrent urinary tract infections in women: a randomized clinical trial. World J Urol. 2014;32(1):79-84. Available from: https://www.ncbi.nlm.nih.gov/pubmed/23633128

    RATIONALE: In 1 RCT Kranjcec et al 2014 (N=308) compared D-mannose (2gms in 200mls per day) with antibiotic prophylaxis (nitrofurantoin 50mg a day) and with no treatment. **Patients in the D-mannose group and the antibiotic prophylaxis group had a significantly lower risk of recurrent UTI episodes during therapy compared to patients in the no treatment group (RR 0.239 and 0.335, P\0.0001)**. Patients in the D-mannose group had a significantly lower risk of side effects compared to patients in Nitrofurantoin group (RR 0.276, P\0.0001), but the clinical importance of this finding is low because Nitrofurantoin was well tolerated. D-mannose works by sticking to *E.coli* lectin on their fimbria preventing adhesion to the bladder, so promoting an immune response. This is high quality evidence and there is no reason why this should not give similar results in older women although further studies will be needed in both age groups to confirm these excellent results.

    Health professionals may want to consider recommending D-mannose as an alternative preventative treatment.

38. Eriksen BC. A randomized, open, parallel-group study on the preventive effect of an estradiol-releasing vaginal ring (Estring) on recurrent urinary tract infections in postmenopausal women. *Am J Obstet Gynecol*. 1999 May; 180(5):1072-1079. Available from: http://www.sciencedirect.com/science/article/pii/S0002937899705971.

    RATIONALE: A randomised controlled trial of moderate quality, including 108 postmenopausal women, aiming to detect a difference in time until the first recurrence of a urinary tract infection during treatment with an estradiol-releasing silicone vaginal ring, versus no oestrogen treatment. 53 women were randomly assigned to the estradiol-releasing vaginal ring (Estring) group, and 55 were assigned to the control group. **Results indicated that approximately 45% of the women with the vaginal ring remained free of disease, in comparison to approximately 20% in the control group (p=.008)**. The vaginal ring lowered vaginal pH, and the time to first recurrence was effectively prolonged by the treatment. The authors

conclude that the use of vaginal oestrogen can be considered for the prevention of recurrent UTI in postmenopausal women.

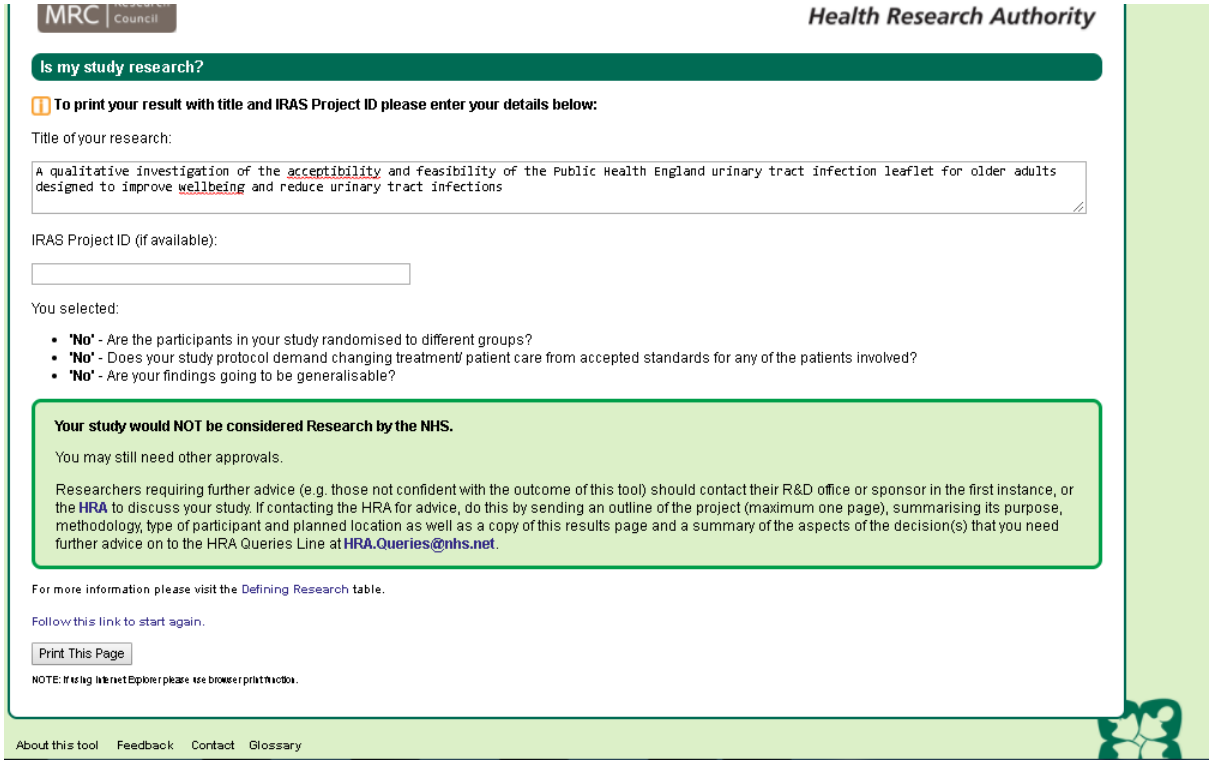
Health professionals may want to consider recommending vaginal hormone treatment to postmenopausal women as an alternative preventative treatment.

39. Perrotta C, Aznar M, Mejia R, Albert X, Ng CW. Oestrogens for preventing recurrent urinary tract infection in postmenopausal women. *Cochrane Database Syst Rev*. 2008(2):CD005131. Available from: https://www.ncbi.nlm.nih.gov/pubmed/18425910

RATIONALE: A meta-analysis of 9 RCTs examining the efficacy of oestrogen in decreasing the rate of recurrent urinary tract infection in postmenopausal women and their safety. All studies within the meta-10 analysis included post-menopausal women defined as more than 12 months since their last menstrual period. Recurrent urinary tract infection was defined as 3 episodes of infection in the last 12 months or 2 episodes of infection in the last 6 months. The meta-analysis included comparisons of oral oestrogens 14 versus placebo, vaginal oestrogen versus placebo and vaginal oestrogen versus oral 15 antibiotics. The main efficacy outcome was reduction in recurrent urinary tract infection. **They found that oestrogen administered as a cream with an applicator showed a significant reduction in recurrent urinary tract infection when compared to placebo during an 8-35 month treatment period, and vaginal oestrogen cream was significantly more effective than ofloxacin (600mg a 46 day) in reducing recurrent urinary tract infection at the end of the 3-month treatment period.** The benefit only lasted as long as participants were on treatment. No benefit was seen 2 months after stopping treatment.

Health professionals may want to consider recommending vaginal hormone treatment to postmenopausal women as an alternative preventative treatment.

Appendix 4 - NHS Health Research Authority (HRA) confirmation of service evaluation



MRC Council

Health Research Authority

Is my study research?

To print your result with title and IRAS Project ID please enter your details below:

Title of your research:

A qualitative investigation of the acceptibility and feasibility of the Public Health England urinary tract infection leaflet for older adults designed to improve wellbeing and reduce urinary tract infections

IRAS Project ID (if available):

You selected:

- **'No'** - Are the participants in your study randomised to different groups?
- **'No'** - Does your study protocol demand changing treatment/ patient care from accepted standards for any of the patients involved?
- **'No'** - Are your findings going to be generalisable?

Your study would NOT be considered Research by the NHS.

You may still need other approvals.

Researchers requiring further advice (e.g. those not confident with the outcome of this tool) should contact their R&D office or sponsor in the first instance, or the HRA to discuss your study. If contacting the HRA for advice, do this by sending an outline of the project (maximum one page), summarising its purpose, methodology, type of participant and planned location as well as a copy of this results page and a summary of the aspects of the decision(s) that you need further advice on to the HRA Queries Line at HRA.Queries@nhs.net.

For more information please visit the Defining Research table.

Follow this link to start again.

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Appendix 5 – Interview schedules

Care home staff interview schedule

Provide participant with a copy of the information form and consent form. If they have already read the information form and signed the consent form, continue to read the paragraph below, otherwise allow sufficient time to read the information form, ask any questions and sign the consent form.

Introduction [please read this to the interviewee before the interview takes place]

My name is Leah Jones, I work for Public Health England – we are a government organisation that aim to protect and improve the nation's health and wellbeing. I am interviewing you on behalf of Public Health England as part of a study to explore attitudes and experiences to management of urinary tract infections in care homes. The interviews will be used to help us inform how we may improve our UTI leaflet for use in care homes and understand its implementation in care homes.

If you don't mind, the interview will be recorded and I will take a few notes. The notes will be anonymous and the recording will be anonymised when it is typed up, meaning we will not use your name or any other information that could be used to identify you. Are you happy to go ahead with the interview?

Background Questions

1. What is your job role?
2. How long have you worked here?
3. How big is this care home/how many beds?
4. What type of care home is this? i.e. older adults only? Dementia? Nursing?
5. Tell me about how you have used the UTI leaflet.

Knowledge Knowledge about UTIs, prevention, self-care, Procedural knowledge about diagnosis, treatment and management	What is your understanding of diagnosing UTI? What is your understanding of managing UTI? Tell me what you know about using dipsticks for older adults with urinary symptoms? Tell me about whether the UTI leaflet has improved your knowledge, if at all.
Notes:	
Skills Competency, ability, training requirements	How many times have you used the leaflet, if at all? How often do you use dipsticking to check for suspected UTI?

	Thinking about your own experience using the leaflet, what skills do you think are needed in order to use the leaflet? What kind of training, if at all, might care staff need in order to use the leaflet?
Notes:	
Behavioural regulation (Anything aimed at managing or changing objectively observed or measured actions e.g. Self-monitoring, breaking habit, action planning - Barriers and facilitators, action planning)	What factors if any, have encouraged/helped you to use the leaflet? Probe: Any training, action planning? (If leaflet not used) What, if anything, would need to change in order for you to use the leaflet? What factors have influenced your behaviour to use dipsticks?
Notes:	
Beliefs about capabilities (Confidence in one's own ability – specifically regarding use of the resources - Self-efficacy, control)	How confident do you feel about using the leaflet? How easy or difficult is it to use the leaflet? How confident do you feel in not using dipsticks?
Notes:	
Beliefs about consequences (What they think will happen – specifically about what will happen if they use or don't use the resources - Outcome expectancies)	What are the benefits of using the leaflet? What are the disadvantages of using the leaflet? What are the benefits and disadvantages of not using dipsticks? Probe: informed/empowered residents, improved management,
Notes:	
Optimism	How optimistic are you that using the leaflet can: Decrease UTI rates? Improve management of UTI? Decrease antimicrobial resistance?
Notes:	
Emotion Fear, anxiety, anticipated regret	What emotions, if any, do you feel using the resources? Probe: worry, anxiety
Notes:	

Environmental context and resources (Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour)	Is there anything in your daily routine that prevents or helps you in using the leaflet? Do you have any other resources that help with diagnosis or management of UTI? Is there anything in your daily routine that influences your use of dipsticks?
Notes:	
Memory, attention and decision processes	Do you think about the leaflet when you encounter a resident with urinary symptoms? Can you tell me about situations where you would use the leaflet? Can you tell me about situations where you would not use the leaflet? What factors influence your decision to use the leaflet? Do you ever forget? What factors influence your decision to use a dipstick? Probe: Time, staffing, other demands, forget,
Notes:	
Goals (Mental representations of outcomes or end states that an individual wants to achieve - priorities, intrinsic motivations)	How important is it to you to use the leaflet? How important is it to you to have the leaflet available in care homes? How important is it to you to not use dipsticks? Probes: resistant UTIs, asymptomatic bacteriruria, UTI severity, AMR in general
Notes:	
Intentions (A conscious decision to perform a behaviour or a resolve to act in a certain way)	How likely are you to use the leaflet moving forwards? How likely are you to use dipsticks with older adults with urinary symptoms moving forwards?
Notes:	
Social influence Social support, social norms	What support is provided to help you use the leaflet? What do your colleagues think about using the leaflet?

	What do residents think about being given a leaflet? What do family members think of you using the leaflet? What do your colleagues think about dipsticking urine for urinary symptoms?
Notes:	
Professional role and identity (A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting)	Is there anything about your role that may prevent or help you in using the leaflet? i.e. perceived role in diagnosis, urine specimen collection, advising residents? Is there anything about your role that may encourage or prevent you from using dipsticks?
Notes:	
Reinforcement (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus e.g. Rewards, incentives, punishment, consequents, reinforcement, contingencies, sanctions.)	Are there any consequences or incentives to using the leaflet? Are there any consequences or incentives to using dipsticks? Probe: Has the care home provided rewards, incentives etc.

GP staff interview schedule

Provide participant with a copy of the information form and consent form. If they have already read the information form and signed the consent form, continue to read the paragraph below, otherwise allow sufficient time to read the information form, ask any questions and sign the consent form.

Introduction [please read this to the interviewee before the interview takes place]

My name is Leah Jones, I work for Public Health England – we are a government organisation that aim to protect and improve the nation's health and wellbeing. I am interviewing you on behalf of Public Health England as part of a study to explore attitudes and experiences to management of urinary tract infections in older adults. The interviews will be used to help us inform how we may improve our UTI leaflet for use with older adults, improve the diagnostic guidance for UTI and understand their implementation.

If you don't mind, the interview will be recorded and I will take a few notes. The notes will be anonymous and the recording will be anonymised when it is typed up, meaning we will not use your name or any other information that could be used to identify you. Are you happy to go ahead with the interview?

Background Questions

1. What is your job role?
2. How long have you worked here?
3. Can you tell me a bit about how the UTI resources have been implemented in this practice, if at all?
4. Tell me about how you have used the UTI leaflet.
5. Tell me about how you have used the UTI diagnostic guidance.

For the next set of questions I want you to draw on your experience with older adults in the community and in care homes, if applicable.

Knowledge Knowledge about UTIs, prevention, self-care, Procedural knowledge about diagnosis, treatment and management	What is your understanding of diagnosing UTI in older adults? What is your understanding of managing UTI in older adults? Tell me what you know about using dipsticks for older adults with urinary symptoms? Tell me about whether the UTI resources have improved your knowledge, if at all. Did the workshop teach you anything new?
Notes:	
Skills Competency, ability, training requirements	How many times have you used the leaflet and the diagnostic guide? How often do you use dipsticking to check for suspected UTI in older adults? Thinking about your own experience using the resources, what skills do you think are needed in order to use the leaflet? Thinking about your own experience using the diagnostic guide, what skills do you think you might need in order to use the diagnostic guide? What kind of training, if at all, might GP staff need in order to use the diagnostic guidance?
Notes:	
Behavioural regulation (Anything aimed at managing or changing objectively observed or measured actions e.g. Self-monitoring, breaking habit, action planning - Barriers and facilitators, action planning)	What factors if any, have encouraged/helped you to use the resources? Probe: the workshops, action planning, prompts, audits? Have the workshops encouraged you to change your practice in any way?

	(If resources not used) What, if anything, would need to change in order for you to use the resources? What factors have influenced your behaviour to use dipsticks?
Notes:	
Beliefs about capabilities (Confidence in one's own ability – specifically regarding use of the resources - Self-efficacy, control)	How confident do you feel about using the leaflet? How confident do you feel about using the diagnostic guide? How easy or difficult is it to use the resources? How confident do you feel in not using dipsticks?
Notes:	
Beliefs about consequences (What they think will happen – specifically about what will happen if they use or don't use the resources - Outcome expectancies)	What are the benefits of using the resources? What are the disadvantages of using the resources? What are the benefits and disadvantages of not using dipsticks? Probe: informed/empowered residents, improved management,
Notes:	
Optimism	How optimistic are you that using these resources can: Decrease UTI rates? Improve management of UTI? Decrease antimicrobial resistance?
Notes:	
Emotion Fear, anxiety, anticipated regret	What emotions, if any, do you feel using the resources? How does the concept of AMR make you feel? Probe: worry, anxiety
Notes:	
Environmental context and resources (Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour)	Is there anything in your daily routine that prevents or helps you in using the resources? Do you have any other resources that help with diagnosis or management of UTI? Is there anything in your daily routine that influences your use of dipsticks?
Notes:	

Memory, attention and decision processes	What do you remember from the workshop? Do you think about the resources when you encounter an older adult with urinary symptoms? Can you tell me about situations where you would use the leaflet? Can you tell me about situations where you would not use the leaflet? What factors influence your decision to use the diagnostic guide? Do you ever forget? What factors influence your decision to use a dipstick for older adults? Probe: Time, staffing, other demands, forget,
Notes:	
Goals (Mental representations of outcomes or end states that an individual wants to achieve - priorities, intrinsic motivations)	How important is it to you to use these resources? How important is it to you to have these resources available in care homes? How important is it to you to have these resources available in general practice? How important is it to you to not use dipsticks for older adults? Probes: resistant UTIs, asymptomatic bacteriruria, UTI severity, AMR in general
Notes:	
Intentions (A conscious decision to perform a behaviour or a resolve to act in a certain way)	How likely are you to use these resources moving forwards? How likely are you to use dipsticks with older adults with urinary symptoms moving forwards?
Notes:	
Social influence Social support, social norms	What support is provided to help you use the resources? What do your colleagues think about using these resources? What do older adults think about being given a leaflet?

	What do your colleagues think about dipsticking urine for urinary symptoms?
Notes:	
Professional role and identity (A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting)	Is there anything about your role that may prevent or help you in using these resources? i.e. urine specimen collection, advising older adults? Is there anything about your role that may encourage or prevent you from using dipsticks?
Notes:	
Reinforcement (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus e.g. Rewards, incentives, punishment, consequents, reinforcement, contingencies, sanctions.)	Are there any consequences or incentives to using the resources? Are there any consequences or incentives to using dipsticks? Probe: are there rewards or incentives etc.

Older adult interview schedule

Provide participant with a copy of the information form and consent form. If they have already read the information form and signed the consent form, continue to read the paragraph below, otherwise allow sufficient time to read the information form, ask any questions and sign the consent form.

Introduction [please read this to the interviewee before the interview takes place]

My name is Leah Jones, I work for Public Health England – we are a government organisation that aim to protect and improve the nation's health and wellbeing. I am interviewing you on behalf of Public Health England as part of a study to explore attitudes and experiences to management of urinary tract infections in care homes and the community. The interviews will be used to help us inform how we may improve the leaflet for urinary tract infections for use in care homes and the community, and understand how it is used.

(At this point establish their preferred terminology for UTI and use from this point onwards)

If you don't mind, the interview will be recorded and I will take a few notes. The notes will be anonymous and the recording will be anonymised when it is typed up, meaning we will not use your name or any other information that could be used to identify you. Are you happy to go ahead with the interview?

Background Questions

1. Care home/general practice:
2. *If applicable*: How long have you been in this care home?
3. Tell me about your experiences of having a urinary tract infection.
4. Can you tell me about when you were given the UTI leaflet (Show the leaflet)?
5. What were your initial thoughts of the leaflet?

6. Can you tell me what you remember from the leaflet?
7. How has the leaflet influenced you, if at all?

Knowledge Knowledge about UTIs, prevention, self-care, Procedural knowledge about diagnosis, treatment and management	What if anything, has the leaflet taught you about UTIs? Is there anything you don't understand on the leaflet? Probe: Prevention, self-care, treatment, antibiotics
Notes:	
Skills Competency, ability, training requirements	Were you able to do any of the recommendations in the leaflet? Did you struggle with anything? Probe: Drink more, washing, wiping, voiding after sex etc.
Notes:	
Beliefs about capabilities (Confidence in one's own ability – specifically regarding use of the resources - Self-efficacy, control)	How easy or difficult has it been to try and do any of the recommendations in the leaflet?
Notes:	
Environmental context and resources (Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour)	Is there anything in your daily routine that makes it difficult for you to do some of the things mentioned in the leaflet? Is there anything in your daily routine that makes it easier for you to do some of the things mentioned in the leaflet? Do you have any other information sources around UTIs?
Notes:	
Professional role and identity (A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting)	Is there anything about your situation that makes it difficult to do some of the things recommended in the leaflet? To what extent are your family/partner/carers responsible for helping you with the recommendations from the leaflet?
Notes:	
Beliefs about consequences (What they think will happen – specifically about what will happen if they use or don't use the resources - Outcome expectancies)	What do you think are the benefits of being given this leaflet? Do you think there are any disadvantages to being given this leaflet? Probe: feeling more informed, being able to self-care – not seeking care if needed, misunderstanding What do you think the benefits and disadvantages might be from not taking unnecessary antibiotics?
Notes:	
Optimism	How optimistic are you that using this leaflet can: Reduce your chances of having a UTI?

	Improve the way you look after yourself when you have a UTI? Reducing your chances of needing an antibiotic?
Notes:	
Emotion	How does reading this leaflet make you feel, if anything? Probe: worried, confident, re-assured?
Notes:	
Memory, attention and decision processes	How often do you look at the leaflet, if at all? How well do you remember the information on the leaflet? Do you ever forget to do any of the recommendations in the leaflet?
Notes:	
Goals (Mental representations of outcomes or end states that an individual wants to achieve - priorities, intrinsic motivations)	How important is it to you to have this leaflet available to you and other residents? How important is it to you to try and avoid having a UTI? How important is it to you to try and avoid antibiotics by preventing infection?
Notes:	
Social influence Social support, social norms	Did the care/GP staff explain the leaflet to you? Do the care/GP staff support you in adhering to the advice in the leaflet? Do your friends and family support you in adhering to the advice in the leaflet?
Notes:	
Intentions (A conscious decision to perform a behaviour or a resolve to act in a certain way)	How likely are you to use the leaflet in future? How likely are you to ask for antibiotics for urinary symptoms in future?
Notes:	

Stakeholder interview schedule

Provide participant with a copy of the information form and consent form. If they have already read the information form and signed the consent form, continue to read the paragraph below, otherwise allow sufficient time to read the information form, ask any questions and sign the consent form.

Introduction [please read this to the interviewee before the interview takes place]

My name is Leah Jones, I work for Public Health England – we are a government organisation that aim to protect and improve the nation's health and wellbeing. I am interviewing you on behalf of Public Health England as part of a study to explore attitudes and experiences to management of urinary tract infections in care homes. The interviews will be used to help us inform how we may

improve our UTI leaflet for use in care homes, improve the diagnostic guidance for UTI and understand their implementation in care homes.

If you don't mind, the interview will be recorded and I will take a few notes. The notes will be anonymous and the recording will be anonymised when it is typed up, meaning we will not use your name or any other information that could be used to identify you. Are you happy to go ahead with the interview?

Background Questions

1. What is your job role?
2. What organisation do you work for?
3. What region are you in?
4. Can you tell me about your role in relation to care homes/UTIs?
5. Tell me about how you have used/promoted the UTI leaflet.
6. Tell me about how you have used/promoted the UTI diagnostic guidance.

Knowledge Knowledge about UTIs, prevention, self-care, Procedural knowledge about diagnosis, treatment and management	What is your understanding of diagnosing UTIs in care homes? What is your understanding of managing UTIs in care homes? To what extent is dipsticking an issue for you locally? Tell me about whether the UTI resources have had an impact locally, if at all.
Notes:	
Skills Competency, ability, training requirements	What kind of support have you provided to care homes in using the UTI resources? What kind of training, if at all, might care staff need in order to use these resources?
Notes:	
Behavioural regulation (Anything aimed at managing or changing objectively observed or measured actions e.g. Self-monitoring, breaking habit, action planning - Barriers and facilitators, action planning)	What factors if any, have encouraged/helped you to use/disseminate the resources?
Notes:	
Beliefs about capabilities (Confidence in one's own ability – specifically regarding use of the resources - Self-efficacy, control)	How confident do you feel that the resources are being used as a result of your dissemination? How easy or difficult is it to get people to use the resources?
Notes:	

Beliefs about consequences (What they think will happen – specifically about what will happen if they use or don't use the resources - Outcome expectancies)	What do you think are the benefits of using the resources? What do you think the disadvantages might be of using the resources? Probe: informed/empowered residents, improved management,
Notes:	
Optimism	How optimistic are you that using these resources can: Decrease UTI rates? Improve management of UTI? Decrease antimicrobial resistance?
Notes:	
Environmental context and resources (Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behaviour)	Is there anything in your daily routine that prevents or helps you in disseminating the resources? Do you have any other resources that help with diagnosis or management of UTI locally?
Notes:	
Memory, attention and decision processes	What influenced your decision to promote UTI resources locally?
Notes:	
Goals (Mental representations of outcomes or end states that an individual wants to achieve - priorities, intrinsic motivations)	How important is it to you to use these resources? How important is it to you to have these resources available in care homes? How important is it to you for care homes to not use dipsticks? Probes: resistant UTIs, asymptomatic bacteriruria, UTI severity, AMR in general
Notes:	
Intentions (A conscious decision to perform a behaviour or a resolve to act in a certain way)	How likely are you to use/disseminate these resources moving forwards? In what way will you plan to implement or promote these resources? Probe: Any complementary resources/education?

Notes:	
Social influence Social support, social norms	What support is provided to you to help you use/disseminate the resources? What do your colleagues think about these resources? What do your colleagues think about your work promoting the UTI resources?
Notes:	
Professional role and identity (A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting)	Is there anything about your role that may prevent or help you in using/disseminating these resources? i.e. access to care homes, local status
Notes:	
Reinforcement (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus e.g. Rewards, incentives, punishment, consequents, reinforcement, contingencies, sanctions.)	Are there any consequences or incentives to using/disseminating the resources? Have you implemented any consequences or incentives to using dipsticks?