The Strategy Unit.

Hydration Pilots Evaluation
Final Report

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Contents

Executive Summary

Programme background

Antimicrobial resistance (AMR) has long been identified as a global threat by the World Health Organisation (WHO), and a five-year national action plan for preventing AMR was published for the UK in 2019. A key contributing factor to AMR is the increasing level of antibiotic prescribing resulting from the volume of urinary tract infections (UTIs) and healthcare associated gram-negative bloodstream infections (HA-GNBSIs) among older people aged 65 years and above admitted to hospital for UTIs.

The NHS England AMR programme team commissioned a series of Hydration pilots, designed to test and evidence how hydration-related interventions affect UTI rates among older people. These pilots addressed a recognised evidence gap linked to the AMR national action plan target for reducing gram-negative healthcare-associated infections introduced in 2022. This target was identified and recommended for action by the Advisory Committee on Antimicrobial Prescribing, Resistance and Healthcare Associated Infections (APRHAI) to the Department of Health and Social Care (DHSC) in 2021. The pilots also assessed other outcomes for older people both in the community and healthcare settings.

The eight pilot sites, from Cheshire and Merseyside, Norfolk and Waveney, Northumbria, Nottinghamshire, South East region, South West region, South West London and South Yorkshire tested interventions including: care home staff needs assessments; multidisciplinary care home staff training on the importance of hydration preventing UTIs and other relevant topics; ranges of care home-based actions including structured drinks rounds; care home staff behavioural change interventions; smart cups for measuring care home resident fluid intake; personal hydration plans and diaries for patients; and distributing co-designed educational resources to the public.

Evaluation approach

The Strategy Unit (Midlands and Lancashire CSU), on behalf of the NHS England AMR team, conducted a mixed-methods evaluation of this pilots' programme. This report describes both qualitative and quantitative, process and impact learning from the pilots.

Qualitative findings are synthesised from 97 semi-structured interviews conducted with key staff and stakeholders from eight pilot sites over two periods of fieldwork. This included 49 interviews between May 2023 and March 2024[1] involving 58 people and 48 interviews between September 2024 and January 2025 also involving 58 people (a mixture of repeat and new participants). The

[1] Staggered to accommodate different starting dates for pilots in the first year, and including a final interview with pilot leads from Northumbria

initial round of interviews explored the design and early implementation of the pilot interventions while the final round explored ongoing implementation, scaling up activities and sustainability.

A programme outcome metric minimum data set (MDS) was developed during the evaluation scoping phase, but pilot sites were not all able to consistently collect these metrics. Individual impact analyses, using an interrupted time series (ITS) approach, and based on metrics sites were able to collect, were therefore conducted for seven of the eight pilot sites (with some data and implementation limitations preventing full site coverage).

Individual case studies drawing on these mixed-method findings and local evaluations supplied by pilot sites were produced and thematically analysed to inform this report and recommendations for different stakeholders supporting or implementing future hydration-related interventions.

Key findings

The key findings from the evaluation include both implementation lessons and pilot outcomes.

Implementing the pilots

- **Variations in design**: locally-led design or selection processes at pilot sites enhanced stakeholder engagement and buy-in but may have led to unintended variations, including some potentially conflicting information, in educational content between pilot sites
- **Co-design or co-production:** although valued as a part of the intervention development process by some pilot sites, first-year implementation timescale pressures and challenges engaging frail care home residents limited their ability to conduct a full co-design process with older people and care home staff
- **Recruitment and engagement:** pilot sites used strategies including dedicated project management resources, targeted recruitment, in-person engagement (such as unannounced visits to care homes), or tiered accreditation-based incentives, to address participation or engagement barriers, such as staff workload pressures
- **Implementing digital interventions**: smart cups or hydration-focused apps showed potential for tracking fluid intake or raising staff awareness of the importance of hydration for care home residents, but this depended on product quality, digital infrastructure of care homes and integration with existing electronic care planning systems
- **Working with digital startups:** pilot sites found that partnering with digital or manufacturing startup companies carried risks and costs, making small-scale projects a safer (clinically and financially) starting point

- **Sustaining interventions:** to sustain their work, pilot sites shared materials online, adapted initiatives for other population groups, enhanced online training access, and created data collection tools for future monitoring, but funding gaps and staff turnover threaten long-term sustainability
- **Addressing knowledge gaps about hydration and UTIs:** there was low baseline awareness of the importance of hydration for older adults among care home staff and the public across all pilot sites, and an outdated understanding in primary care of UTI diagnostic best practice for older people, indicating the importance of educating all relevant stakeholders
- **Training formats and delivery modes:** trainers preferred in-person sessions for deeper learning, while pilot leads and stakeholders favoured accessible, cost-effective online training; blended approaches offer a balanced solution if funding permits
- **Integrating care home interventions into usual practice:** some pilot site participants highlighted that sustaining better hydration practices in care settings requires embedding them into daily operations, by addressing cultural and practical barriers (such as staff attitudes, or catering budgets), promoting good staff hydration habits, and securing management support for system changes and training
- **Data collection and outcome measurement challenges:** pilot sites experienced difficulties and delays with finalising data-sharing agreements, inconsistent metric data collection and coding across health and care organisations, and small participant numbers, which hindered the measurement of the effectiveness of the interventions
- **Measuring fluid intake:** pilot site participants highlighted that accurate recording of changes in hydration among older people outside of academic or clinical trials is challenging due to reliance on proxy or self-report measures, and the potentially unfeasible data collection burden on care home staff or other participants.

Pilot outcomes and benefits for participants

From the individual ITS analyses, four of seven hydration pilots (Cheshire and Merseyside (C&M), Nottinghamshire (NS), South West region (SW) and South Yorkshire (SY)) showed statistically significant improvements in one or more of their metrics. These included:

- Two pilots, NS and SY, showed decreased UTI diagnoses
- Two pilots, C&M and SY, showed decreased antibiotic prescribing
- Three pilots, C&M, NS, and SW showed reductions in both emergency admissions for UTIs and falls.

However, limitations in data collection, such as variations in available metrics and difficulties in measuring fluid intake means the evaluation cannot conclude definitively that the positive trends for

UTI prevention seen at some pilots were a direct result of the specific hydration-focused interventions. It is possible that other local factors which were not measured as part of this evaluation, may have (also) contributed to the positive trends. The variation between pilot sites (working with different target audiences, in different settings and involving different numbers of participants), and the variation in metrics and data sources used for measuring impact also prevents comparisons between interventions.

Despite this, interview participants from all the pilot sites remained encouraged by the benefits of different hydration-related interventions reported in local evaluations and perceived by staff participating in or delivering interventions. These included improvements in other health outcomes for older people such as improved skin integrity, general wellbeing and mental clarity, and better hydration-related practices among staff (as well as perceptions of reduced UTIs and falls).

Conclusions and recommendations

Overall, the Hydration Pilots programme provided many learning opportunities, revealing the complexities of implementing hydration-related interventions and their potential for positive outcomes. Despite challenges in attributing specific results, it underscored the importance of tailored approaches, incorporating evaluation aims into programme or intervention design, and addressing systemic barriers to optimise the impact of future initiatives.

For any **organisations considering implementing interventions related to improving hydration levels in older people and/or involving care home residents,** the following summary recommendations can be used to model their design approaches, as well as anticipate and address delivery challenges:

- Allocate sufficient time for consensus building, co-design, and tailoring interventions to local contexts, while ensuring content and design are evidence-based
- Actively involve target audiences in all stages of implementation (and evaluation) to ensure relevance and alignment
- Address or plan for barriers to engagement, such as digital limitations, competing programmes, and staff workload challenges
- Scale up gradually and conduct initial user-testing and due diligence when working with new partners
- Provide accessible training formats and support, especially for staff with low digital literacy, and optimise blended learning approaches
- Ensure sustainability by offering adaptable interventions, planning for what can still be delivered with the minimum resources available and collaborating with other health and care

organisations to overcome systemic barriers to normalising intervention activities as usual practice

- Leverage data collection and personal stories to demonstrate value, while continuing to monitor outcomes and refine interventions for effectiveness, taking seasonality and feasibility of data collection into consideration when selecting outcome measures and analysing results.

For any relevant **national policy or programme teams** considering future or follow-on actions from the programme, the following summary recommendations are made:

- Ensure any nationally available (or mandatory) training, guidance, and communication materials on hydration are updated with, and quality assured against the latest evidence base on effective practice to support awareness, consistency, and engagement across settings
- Consider and address technical, organisational, and systemic barriers to implementing and evaluating hydration interventions before launching any future programmes, including quality assuring local contingency plans, feasibility studies of data collection measures (particularly when involving care homes or domiciliary care), and avoiding variation in interventions where comparisons are required
- Foster collaboration across relevant health and care providers (such as residential, domiciliary and primary care) to promote adoption and alignment of best practice in hydration and UTI diagnostics and prevention, and effective data-sharing for monitoring intervention impacts
- Support continuous learning and improvement by providing evaluation resources (such as data collection templates or dashboards), sharing evidence, and maintaining forums for staff to exchange good practices and lessons learned.

1. Introduction

1.1 Background and context

Antimicrobial resistance (AMR) has long been identified as a global threat by the World Health Organisation (WHO), and the UK government. A five-year (2019-2024) national action plan for AMR was published by the Department of Health and Social Care (DHSC) in 2019 to lead the UK's response to this threat. A key contributing factor to AMR is the increasing level of antibiotic prescribing resulting from the volume of urinary tract infections (UTIs) and healthcare associated gram-negative bloodstream infections (HA-GNBSIs) among older people aged 65 years and above admitted to hospital for UTIs. Recent data shows that this groups of patients make up the majority of hospital admissions for urinary tract infections (UTIs) in England.[2] Once admitted, prolonged hospital stays in older people are associated with deteriorating health and higher risk of severe infections including HA-GNBSIs.

Although poor hydration has long been considered a risk factor for UTIs, the evidence for increasing fluid intake as a prevention strategy remains limited. A subsequent addendum to the five-year national action plan for AMR was published by DHSC in May 2022. It set out the need to focus on UTIs and to research any association between hydration and the prevalence and outcome of urinary tract or bloodstream infections, in support of the national action plan ambition to halve HA-GNBSIs by 2024. This target was identified and recommended for action by the Advisory Committee on Antimicrobial Prescribing, Resistance and Healthcare Associated Infections (APRHAI) to the Department of Health and Social Care (DHSC) in 2021.

From October 2022, NHS England funded a series of pilots to test and evidence the impact of hydration interventions on UTI levels and other outcomes for older patients, both in the community and healthcare settings. The interventions tested included education toolkits and competency-based training for staff, smart cups, a mobile-based fluid recording app aimed at care home staff, and educational campaigns and personal hydration diaries aimed at older people living in the community. Section 1.2 provides further detail about these interventions.

The aim of the hydration pilot programme was to:

- Support the development of an evidence base on the effect of hydration on the prevention of UTIs

[2] There were more than 1.8 million hospital admissions involving UTIs (primary and secondary diagnoses) between 2018-19 and 2022-23 – the majority of which were patients aged 65 and older. In 2022-2023 of the 147,285 hospital admissions with a primary diagnosis of UTI, 56% (82,392) were people over 65 years old, with the highest number in the 80-84 age group (17,280 admissions). Data now archived at: https://webarchive.nationalarchives.gov.uk/ukgwa/20240503133823/https://digital.nhs.uk/supplementary-information/2023/hospital-admissions-relating-to-urinary-tract-infections (Accessed March 2025)

- Inform the choice of hydration interventions that will support the overall aim of reduction in HA-GNBSIs, antimicrobial prescribing and resistance
- Demonstrate any improvement arising from the interventions, particularly that which is sustainable and reproducible in other localities.

1.2 Programme design and pilot site interventions

The Hydration Pilots programme initially funded eight pilot sites to test various interventions for a year, to be followed by a second year for scaling-up a selection of interventions demonstrating initial effectiveness. However, due to first-year implementation delays for many sites, NHS England instead offered funding for a second year to sites to continue and expand ('scale and spread') the implementation of their original interventions. The sites and the interventions they trialled are summarised in Table 1.1. Other important notes about pilot site implementation during the programme include:

- Implementation of interventions began from staggered start dates across the eight pilot sites; this meant that some sites tested their interventions for longer than others
- Due to NHS East of England regional priorities to reduce the ICS's hospital admission rates, the Norfolk and Waveney pilot site began implementation more rapidly than others; their pilot launched in October 2022
- The South Yorkshire Rotherham-based pilot team used the NHS England funding to support the expansion of an intervention they developed prior to the Hydration Pilots programme, based on an intervention trialled in East Berkshire
- Only seven of eight pilot sites progressed their intervention into a second year. The Northumbria pilot team declined second-year funding due to first-year implementation issues, and feasibility challenges with collecting evaluation metrics
- Two sites, Cheshire and Merseyside and South West London, changed their intervention in the second year. This was because the digital smart cup being used in the intervention was discontinued by the manufacturer at the end of the first year. In the second year, both sites switched to testing two different care home educational interventions for staff.
- Expansion of interventions in the second year was a challenge for some pilots due to recurring recruitment delays and organisational change. This affected the extent to which this evaluation can report on finalised learning from implementation (see Methodology).

Table 1.1 Pilot site case study summary

Site name	NHS region	Type of intervention	Implementation dates[3]
Cheshire and Merseyside (C&M)	North West	Smart cup for use in care homes (Year 1). Care staff training and range of interventions[4] (Year 2)	May 2023 – November 2023 January 2024 – December 2024
Norfolk and Waveney (N&W)	East of England	Care home staff needs assessment and training	October 2022 – December 2024
Northumbria (NU)	North East and Yorkshire	Care home staff needs assessment and training plan (Year 1 only)	April 2023 – December 2023
Nottinghamshire (NS)	Midlands	Care home fluid intake monitoring app	January 2023 – December 2024
South East (SE)	South East	Personal hydration plan and diary	November 2023 – December 2024
South West (SW)	South West	Public-facing educational resources	January 2023– December 2024
South West London (SWL)	London	Smart cup for use in care homes (Year 1). Care home staff training and behavioural change intervention (Year 2)	May 2023 – November 2023 January 2024 – December 2024
South Yorkshire (SY)	North East and Yorkshire	Care staff training and range of interventions[5]	January 2023 – December 2024

1.3 Aims and objectives of the evaluation

The NHS England AMR programme team commissioned the Strategy Unit (part of Midlands and Lancashire Commissioning Support Unit) to provide an evaluation of the pilot interventions. The evaluation had two components:

[3] Implementation start date is defined as when first activities related to the intervention began including scoping and co-production activities

[4] Staff participating in training were expected to then select from a range of interventions to apply in their homes including additional structured drinks rounds, greater variety or frequency of drinks provided, larger cups, hydrating foods, and/or hydrating activities.

[5] As above

- A **qualitative, process** evaluation, to provide implementation learning from each pilot as a case study, understanding their different contexts.
- A **quantitative, impact** evaluation, to establish the impact of different interventions on key outcomes including fluid intake, UTI diagnoses and other related health outcomes.

The evaluation aimed to triangulate the data from both of these components to provide evidence of what works, for whom and why.

1.4 Report

This final report brings together the national evaluation findings at the end of the programme in March 2025. It is structured as follows to provide:

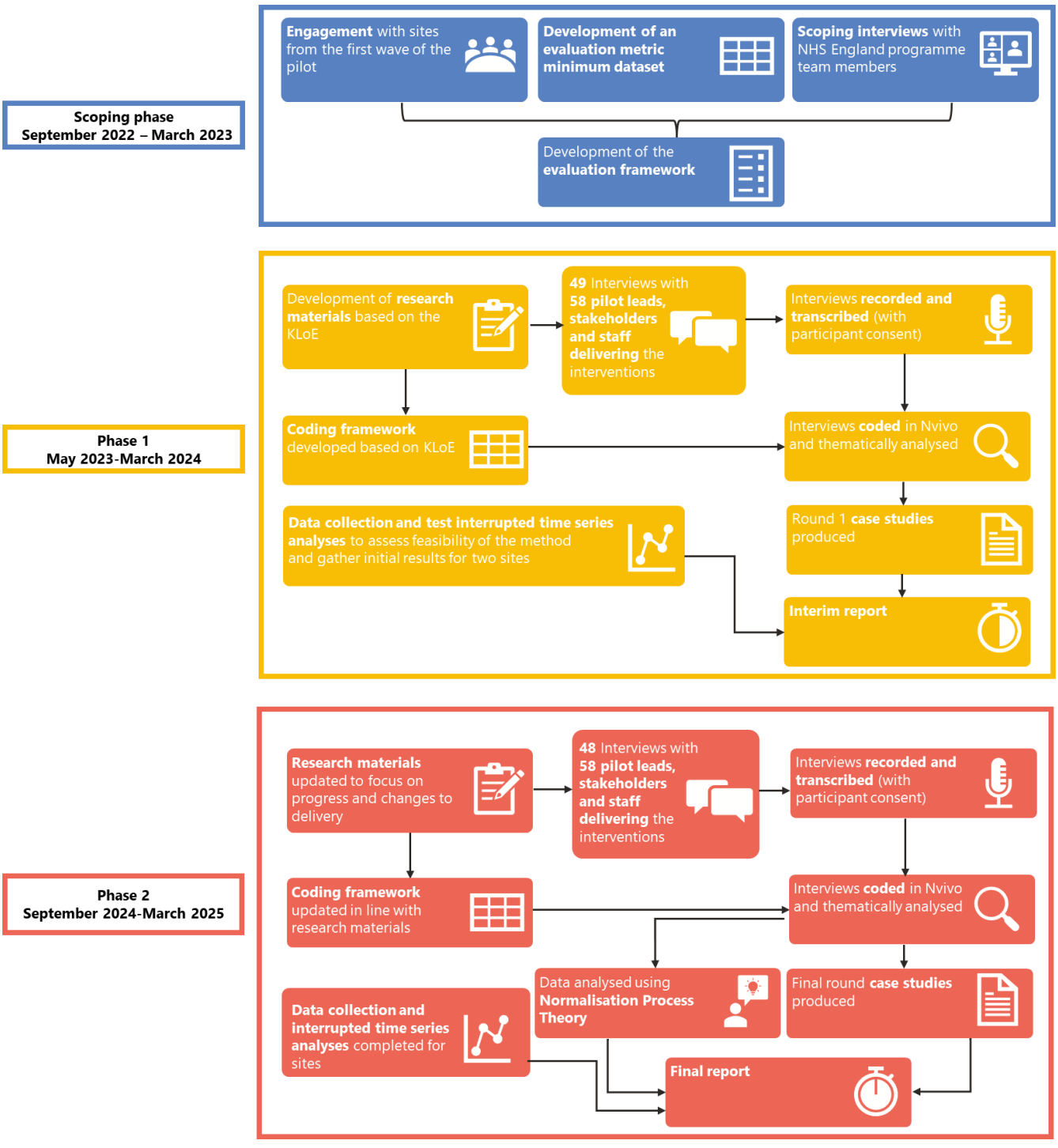
- **Section One:** Background information on the programme design and pilot interventions that are relevant to the evaluation, alongside the aims and objectives of the evaluation
- **Section Two:** Key aspects of the methodology, alongside the methodological limitations which affect the strength of evaluation conclusions.
- **Section Three:** Overview of the process evaluation findings – for more detailed descriptions please refer to individual case study reports (Annex 6)
- **Section Four:** Overview of the impact evaluation findings – for more detailed descriptions please also refer to individual case study reports (Annex 6)
- **Section Five:** Conclusions and recommendations for AMR stakeholders (at national, regional and ICS levels) considering future hydration interventions.

2. Methodology

2.1 Summary of evaluation approach

Figure 2.1 provides a visual summary of the approach taken by this evaluation. Further detail about specific aspects is provided in following sections but for a more comprehensive description please see Annexes 1-5.

Figure 2.1 Phases of the evaluation methodology



2.2 Evaluation framework

The overarching approach to the evaluation (the evaluation framework) was initially designed to answer four key lines of enquiry (KLoE):

- To what extent does the design of the hydration pilot intervention(s) allow them to be successfully implemented and reproduced elsewhere?
- What impact did the intervention(s) have on the skills, knowledge and experience of staff?
- What are the outcomes of delivering the pilot interventions?
- What have been the experience and outcomes for care home residents, people living in their owns homes and/or their carers?

A full description of the evaluation framework and KLoE can be found in Annex 1.

2.3 Qualitative fieldwork and analysis

The evaluation team conducted a first round of semi-structured interviews (n=49) across eight pilot sites from May 2023 to April 2024[6] involving 58 people. The purpose was to explore sites' experience with designing, planning and initially implementing their pilot hydration interventions. They conducted a final round of interviews (n=48) with seven sites from September 2024 to January 2025 also involving 58 people (a mixture of repeat and new participants). The purpose of these interviews was to explore their experience of ongoing implementation, scaling up activities and their views on the sustainability of their interventions. Further details, including interview numbers by pilot site and copies of the topic guides and participant information sheets used, can be found in Annex 2.

Interviews were recorded, transcribed and then coded using NVivo software. Thematic analysis was used to synthesise qualitative data from both rounds to create individual case study reports, an Interim report and this Final Report. As a core focus of the programme was how the pilot interventions might be adopted at scale, the evaluation team also used Normalisation Process Theory (NPT) to analyse findings.[7] Further details of NPT and these analysis domains can be found in Annexes 4 and 5.

[6] These were staggered to allow for different start dates across the pilots – interviews were timed for three months after initial implementation. This also included a final follow-up interview with two further Northumbria interview participants conducted in April 2024 – final round interviews were not completed as they did not continue into year two of implementation.

[7] NPT was also used by Northumbria pilot team to analyse their local evaluation findings; their conclusions about the limited scope for normalisation of the intervention in local care homes contributed to their decision to withdraw from the Hydration Pilots programme.

2.4 Impact evaluation and data triangulation

2.4.1 Impact evaluation approach

An Interrupted Time Series (ITS) analysis was used to assess whether hydration pilots were able to achieve measurable change in the outcome metrics agreed for the evaluation (Table 2.1). Unlike other methods of measuring improvement over time, such as Statistical Process Control (SPC), an ITS can be used to infer causality.

The ITS projects the pre-intervention trend at the point of implementation. It then compares this projection with the actual activity following implementation. This is then assessed for statistical significance to understand whether any observed differences were caused by the implementation of the Hydration Pilot. In contrast to other difference in difference study designs, an ITS makes it possible to accommodate multiple sources of variation, including seasonality in the data.

Two pilot sites (Nottinghamshire and South West London) provided additional data from care homes that were not included in the pilot. These were included as control variables in the ITS analyses for these pilots to reduce the impact of other confounding factors. This was not feasible for the other pilot sites.

Table 2.1 Evaluation minimum dataset (MDS) metrics

Metric	Name
M1	Number of UTI diagnoses
M2	Percentage of increased fluid intake from baseline
M3	Prescriptions of an antibiotic commonly used for UTI
M4	Emergency admissions to hospital due to UTI
M5	Number of falls \ Falls related admissions
M6	Number of ambulance call outs for UTIs
M7	Number of ED attendances for UTIs

For a range of reasons (see limitations below), pilot sites were unable to consistently collect the agreed MDS metrics. The exact metrics collected by individual pilot sites and their data sources used for the ITS analyses are listed in Table 2.2. The data sources include **acute** datasets, such as the secondary uses dataset (SUS), **primary care** systems, such as EMIS and SystmOne, and directly from the **care homes**.

Table 2.2 Metrics used in individual pilot ITS analyses

Pilot site	Metrics used	Sources
Cheshire and Merseyside	• UTI-related primary admissions in the over-65s population	• Acute
	• UTI-related primary admissions in care homes	• Acute
	• Falls-related admissions in patients from care homes	• Acute
	• Combined antibiotics items prescribed to patients aged 70 years and over per 1,000 list size	• Primary care
Norfolk and Waveney	• UTI primary diagnoses	• Acute
	• Antibiotic prescriptions (*Year one only*)	• Primary care
	• Falls	• Acute
	• All diagnosis hospital admissions	• Acute
Nottinghamshire	• UTI primary diagnoses	• Primary care
	• UTI primary and secondary non-elective hospital admissions	• Acute • Primary care
	• Antibiotic prescriptions	• Acute
	• Falls	
South East	• Number of UTI diagnoses during the month per 10,000 patients on the caseload	• Primary care
	• Rates of antibiotic prescriptions commonly prescribed for UTI's during the month per 10,000 patients on the caseload	• Primary care
	• Number of patients who had an emergency attendance due to a UTI during the month per 10,000 patients on the caseload	• Acute
	• Number of patients who had an emergency admission due to a UTI during the month per 10,000 patients on the caseload	• Acute
South West	• UTI non-elective admissions	• Acute
	• Patient had a fall admitted to hospital	• Acute
South West London	• Number of UTI diagnoses during the month per 100 patients on the caseload	• Care home
	• Number of patients who had a fall during the month, regardless of whether they were admitted to hospital per 100 patients on the caseload	• Care home
	• Number of ambulance incidents per 100 patients per month	• Ambulance
	• Number of ambulance conveyances per 100 patients per month	• Ambulance
	• Percentage of increased fluid intake from baseline per 100 patients per month	• Care home

Pilot site	Metrics used	Sources
	• Prescriptions of an antibiotic commonly used for UTI per 100 patients per month	• Primary care
	• Emergency admissions to hospital due to UTI per 100 patients per month	• Acute
	• Number of ED attendances for UTIs per 100 patients per month	• Acute
South Yorkshire	• UTI diagnoses per 100 patients on the caseload	• Acute
	• Antibiotic prescriptions (not specifically for UTI) per 100 patients on the caseload	• Primary care
	• Ambulance call-outs (not specifically for UTI) per 100 patients on the caseload	• Acute

Further detail about the development of the metrics and the impact evaluation approach can be found in Annex 3.

2.4.2 Data triangulation

Process and impact evaluation teams worked together to triangulate data from different sources (interviews and datasets). The qualitative interviews explored each pilot site's intervention, and their assumptions about how these activities would contribute to the desired outcomes (the underpinning theory of change). They also provided insight into the extent to which the pilot sites' interventions may have contributed to the observed changes and supported interpretation of the impact evaluation findings. These findings were incorporated into the case studies produced by the process evaluation team.

2.5 Limitations

There were limitations across both elements of the evaluation. For the process evaluation, it was that it did not include interviews with older people, either living in the community or living in care homes. The reasons and mitigation for this include:

- The feasibility of completing interviews was explored with pilot leads in each site; they often felt that care home residents would struggle to answer evaluation questions and therefore challenged the value of conducting interviews
- In other sites, the pilot team experienced difficulties engaging older participants in local evaluation activities, limited pilot team capacity to support recruitment of older people and evaluation activity timescales prevented additional work with older people
- Instead of direct perspectives from older people and carers, feedback and survey responses collected by local evaluation teams were included in case studies and contributed to the synthesis of findings in Section Three.

For the impact evaluation, the specific limitations were:

1. ITS analysis can only control for time. Therefore, it was not possible to discount the effect of other interventions that may have been operating at the same time as the hydration pilots which aimed to improve the same outcomes. For example, the national rate of falls has shown a downward trend since July 2023 which may mean other confounding factors are influencing the falls metric
2. Pilot sites were not all able to collect some metrics included in the MDS (which were agreed after the pilot sites were selected) as the data was not collected locally in the pre-period and national datasets do not identify care home activity
3. In some instances, ITS analyses could not be conducted even if local data was collected, this is because the incidences (n= 0 or 1) observed for some metrics made analyses unfeasible. In other cases, an ITS could be performed, but the incidences were still small; caution is advised in interpretation (these instances have been highlighted in the report)
4. The collection of different metrics from different sources (and therefore with different definitions) means the results cannot be compared across pilots
5. There were some specific limitations to different pilot sites. These include:
    a. **N&W:** The small numbers in the dataset limited the ability for the impact analysis to detect a change
    b. **SE:** There was a miscoding issue with antibiotic prescriptions in Redhill. Also, improved coding of A&E diagnoses due to the new EPIC system implemented in Frimley from June 2024 led to an increase in the number of ED attendances being recorded. Thus, the result from the analysis should be interpreted carefully.
    c. **SW:** Another intervention aimed at improving UTIs happened at the same time as the hydration pilot in Dorset ICB. As the impact was mainly seen in Dorset, this is likely to be a confounding factor. It was not possible to disaggregate the effect of this intervention from the effect of the hydration pilot
    d. **SWL**: Small numbers, less than two per month, were observed in the rates of UTI diagnosis and falls in some phases.

3. Process evaluation findings

3.1 Section summary

This section presents a synthesis of findings relating to the pilot process from start to finish. This includes reflections on the design, set-up, ongoing implementation, scaling up and sustainability of the pilot interventions. Facilitators and barriers to good practice and implementation are also discussed along with the perceptions of staff.

3.2 Key qualitative themes

The following sections highlight the 11 key themes that emerged across the two rounds of interviews. Findings across these themes are mapped to the three KloEs the evaluation was able to address (as described in Section 2.2). They provide an overview of findings of the implementation and scaling-up process across the eight pilot sites; for more detailed information, please see the individual case studies produced alongside this report (Annex 6).

3.2.1 Intervention features that affected implementation and reproducibility

Five themes from the qualitative findings can be mapped to this KLoE

Theme 1 Variation in design and selection processes

Main summary findings:

- Locally led **design or selection of interventions at pilot sites fostered local stakeholder engagement and buy-in**
- As a consequence of this locally led-process participants raised some concerns that there **may be conflicting details in the educational content being shared in different pilots**, which should be addressed before replicating the pilot interventions in other settings.

Following the funding guidance from the national AMR team, each of the eight pilot sites developed their own local approaches to selecting a hydration intervention to test. These interventions fell into two broadly distinct groups:

1. **Locally-adapted, evidence-based interventions**: Some sites reviewed the evidence base of effective approaches and developed interventions tailored to their local context. These were:
    - Designed in **collaboration with system stakeholders** (SE, SY)
    - **Co-designed or co-produced with the target audience**, such as staff or members of the public (NU, SW).
2. **Externally-developed interventions**: Other sites opted to test interventions already created elsewhere, focusing on enhancing their effectiveness. These were:

- Selected to build on **existing working relationships or links with developers**, further strengthening the evidence base (N&W)
- **Aligned with local digital transformation priorities** (C&M, NS, SWL).

Interview participants noted that involving stakeholders or participants, even when selecting existing interventions, helped to build engagement and buy-in to implementation by including them early in the process.

However, in the final evaluation interviews, some participants suggested that the variations in locally-led design or selection processes might have led to conflicting messaging between the pilots' educational packages. This particularly related to advice on:

- The volume of fluids people should be drinking
- Whether alcohol should be included as part of fluid intake
- The care needed when advising on providing hydrating foods as alternatives to fluids given how little fluid there can be in these foods (such as fruit, custard or gravy), though they can be very important for patients refusing to drink.

These participants stressed the importance of national quality assurance before any broader implementation or endorsement of any individual pilot site interventions.

> *Because it seems a little bit odd that we're all doing slightly different things and telling people different things about how much they need to be drinking, as a real basic. But you know, whether tea and coffee are included, talking about water or talking about fluids, you know. Alcohol, where does that come in?...There was no coherent decision-making [about content] across the pilots.*

Box 1: Theme 1 pilot site example

In **NS**, a multidisciplinary steering group initially assessed different interventions using a scoring matrix system; the Reliance on Carers (ROC) app they selected scored highly in terms of scalability, cost, ease of implementation and impact on care homes. The app had been previously trialled in paper form with care homes in 2017.

Theme 2 Co-production

- **Co-production with care home residents and staff** to develop hydration interventions **was valued across some pilot sites but not fully delivered** by any pilot
- **Co-production challenges** in these pilots (relevant to similar interventions) included first-year timelines which limited the time available for co-production and implementation, workload pressures preventing staff from fully engaging in co-production decisions and difficulties involving frail care home residents.

Interviewees from several sites identified the value of co-production for developing these pilot interventions because it could:

- Provide **lived experience input** where there is an otherwise **limited evidence base of what works** for improving hydration in particular high-risk populations (such as the men aged 70 years or more known to be at higher risk of Klebsiella blood stream infections in SW)
- **Involve the target audience in solving an identified problem**, ensuring any resulting intervention **makes sense to them and meets their needs** (NU, SE, SW)[8]
- Provide **different perspectives and skills** that benefit the design and implementation process by asking the right questions and providing creative ideas (NU).

While two sites were able to incorporate co-production processes into the design phases of their interventions (NU and SW), neither could fully co-produce all aspects of it. The main barriers to full co-production that the sites encountered included:

- **Programme timescales** that reduced the duration and scope of co-production and prevented opportunities for further refinement of the pilot materials after the design phase (SW)
- **Workload pressures** which prevented care home co-production partners providing in-depth feedback (NU)
- **The frailty of care home residents** which hindered their involvement in the co-production group that developed training and competency framework for care home staff (NU).[9]

From the same two sites, interview participants suggested how they and others could improve on co-designing and co-producing with care home residents and staff:

- **Manage time expectations**. Allow a sufficient period of time for a number of co-design and co-production groups to develop rapport, scope ideas, build consensus and make decisions
- **Recruit a range of stakeholders**. Involve group members from a range of backgrounds, including people expected to benefit from the intervention as equal partners, soliciting advice from them and making decisions together
- **Appoint co-production group leads.** Delegate ownership and responsibility to individuals who are skilled in engaging stakeholders from a range of backgrounds, active listening and

[8] Although they were unable to co-produce their intervention, interview participants from the South East described involving participants in designing a response to a problem as a core element of quality improvement projects, which both the South East and South West pilots were explicitly designated as by the teams that applied for funding.

[9] Co-production is often defined as involvement of service users who would benefit from a service or intervention, which is the objective of hydration-related staff training

navigating potentially complex power dynamics across staff, service users, and health and care settings.

- **Provide dedicated project management resource.** Allocate specific resource to organise and oversee effective co-design and co-production as it is a time- and resource-intensive process that can be difficult to fit around other duties
- **Gather feedback at each stage.** Throughout the design and implementation phase use surveys or in-person engagement methods to collect feedback across stakeholders– meeting people in places where they already spend time, rather than expecting them to come to you

"We put to the steering group that … we don't want to… ask people to come to us, we want to go to them. And we explained why and our understanding of patient experience and co-production… So we spent quite a bit of the early days with the steering group explaining that … we're going to focus quite a bit of time on getting a really clear understanding of what do men out there in the community think about hydration? … What are they drinking? What are they not drinking? When are they not drinking? What are their barriers? So that when we understand it better, we can then work out what the problem is to solve. "

Box 2: Theme 2 pilot site example

In **NU** pilot leads from academia convened a co-production group of people with a professional interest in the care of older people. This included staff from three care homes, training and education specialists, academics with expertise in older people's health services, and NHS staff with care home remits, including data analysts and clinical staff (such as nurses, dieticians, and speech and language therapists). The multidisciplinary nature of this team meant that there were several role types with complementary skills (such as evidence synthesis, data interrogation, and data analysis), which interviewees regarded positively. By contrast, the team observed that it was difficult to include care home residents in the co-production group due to their inherent frailty and complex care needs.

Theme 3 Recruitment and engaging participants

- **Recruiting and engaging participants** at pilot sites**, especially care home and PCN staff, proved challenging due to** staff **workload pressures and schedules**
- **Successful** delivery of interventions in this setting and participant group is dependent **on effective strategies** for encouraging and maintaining participation**, such as realistic timescales, discrete resource for implementation including focused recruitment, in-person engagement or tiered accreditation to encourage competition between participants.**

Despite offering either funding or free training, many pilot site teams found it took them **longer than expected to recruit participants or partner organisations**, such as care homes, intermediate care settings, hospital discharge lounges or Primary Care Networks (PCNs). Even those showing initial enthusiasm sometimes struggled to follow through with timely implementation. The reasons for these challenges that interview participants identified included:

- **Conflicting priorities, including responding to illness and staff shortages,** which prevented care home or organisation managers from responding to communications from pilot teams (N&W, NU, SE, SY)
- **Workload pressures or restrictive hours** hindering care home staff, including catering and night staff, from participating in training, particularly an issue for interventions targeting all staff groups (rather than care workers or nurses alone) (N&W, SY)
- Struggles **managing implementation around ongoing normal duties** – this was particularly an issue for pilots working with other organisations to distribute their resources (SW, SE).

Early participants did, however, help bolster engagement by promoting the project through word-of-mouth, offering valuable support to pilot teams (as in C&M, N&W and SY). Other strategies that sites used to try to mitigate these challenges (to varying levels of success) included:

- **Staggering implementation** in phases to allow participating organisations to come on board at their own pace while ensuring sufficient staff capacity to manage multiple relationships simultaneously (C&M, NS, SE, SWL, SY)
- **Visiting** care homes or settings **in-person**, to fit with care manager schedules and brief opportunities for engagement, instead of relying on email or telephone communication (N&W, NU, SY)
- **Providing benefits to care homes** such as bespoke summary statements about staff participation in training which can be used in CQC submissions, or travel expenses to support staff to attend sessions (NU)
- Ensuring the **invitation** came from the **right staff** to leverage existing relationships and to avoid any perceptions of external monitoring or scrutiny (N&W, SE, SY)
- Providing **online versions of training sessions** to offer flexibility and include participants unable to attend in-person sessions (see 3.2.2 Theme 7) (C&M, N&W, NU, SWL, SY)
- **Involving management in training** to demonstrate organisational commitment and increasing frontline staff confidence that training can be implemented (see 3.2.2 Theme 8) (N&W, SY)
- **Establishing different tiers of certified participation** (bronze, silver or gold) to foster healthy competition between participating homes and provide them with tangible achievements to take pride in and showcase (NS).

"[Introducing the tiers] stands out as a monumental shift in engagement. So, since then [we had] a real increase [in the number of homes participating]. I think the incentivisation has been around [by] giving the certificates care staff have felt that they're work has been more noticed. And I don't know if you've seen any of the photographs of staff with their certificates. There's a definite expression of pride."

Box 3: Theme 3 pilot site example

In **SY**, care homes were often more receptive to initial meetings when invited by the pilot team project manager rather than medicines management (MM) staff (also involved in the training), due to concerns about potential intense scrutiny of other systems such as how they store and dispense medicines in the home. Other members of the multidisciplinary team overseeing the pilot also contacted homes to support recruitment, using existing relationships to secure engagement, such as local authority team members promoting training with homes or insisting homes they run receive training. A phased implementation approach, where training was delivered to clusters of care homes in Rotherham (rather than all 50 at once), also ensured that the project manager and supporting members of the MDT were not stretched beyond their capacity.

Theme 4 Digital interventions

- **Digital interventions** can effectively **help with measuring and recording hydration** alongside training but must integrate smoothly with existing electronic care systems
- **Collaborating with small startup organisations carries risks and potential high costs**, making it advisable to start with smaller-scale initiatives.

In all three sites (C&M, NS, SWL) that piloted a digital intervention there were barriers to implementation which led to a significant reduction in expected activity during the course of the pilots' programme, including the ultimate discontinuation of the smart cup intervention in C&M and SWL. Lessons from across these sites included:

- **Integration with existing systems is crucial.** Digital tools must complement care plans and avoid duplication of effort (such as recording the same information into two different systems) or staff will struggle to use the intervention regularly (NS)
- **Connectivity and resource demands pose challenges.** Poor broadband Wi-Fi signal, increased device usage (for example, tablets) requiring more bandwidth, and associated costs can hinder or prevent uptake entirely (C&M, NS, SWL)

- **Developer support and product maturity are key.** Smaller or less experienced manufacturers may struggle to provide adequate training and troubleshooting (C&M, SWL) while a level of responsiveness and involvement with homes can increase engagement or participation (NS)
- **Resident preferences and safety must be prioritised**. Comfort and risk factors, particularly for wearable devices for older people, need careful consideration to gain agreement from them to continue using a product (C&M, SWL)
- **Education and proactive care are essential.** Tools can track hydration or signs of potential deterioration but still rely on care workers to support residents in staying hydrated (C&M, NS, SWL).

Personally, I don't think a mug can ever improve hydration by itself because you're still reliant on carers and having that knowledge. Especially if you've got residents who are very dependent on someone to help them drink, they need to still help them drink. So it doesn't really matter which mug they're drinking out of. They still need to be proactive in doing that.

Box 4: Theme 4 pilot sites example

C&M and **SWL** experienced several issues with their chosen smart cup intervention before its discontinuation. This included connectivity and data quality issues, which undermined its effectiveness for measuring fluid intake levels of residents. The manufacturer did not provide in-person support to train staff on using the cups due to supplier staff shortages and provided inconsistent troubleshooting support. Wristbands were initially paired with the cups (to record fluid intake) but these caused some residents discomfort and in SWL, skin irritation, leading to a redesign and identifying bands on cups were used instead. This change created new issues with ensuring data accuracy as residents drank from other residents' cups. Manual recording of fluid intake continued alongside the intervention, reducing the smart cup's value, until the cup was removed from the market. Both sites subsequently successfully refocused their interventions to training initiatives which engaged an increased number of care homes.

Theme 5 Sustaining interventions

- Interviewees discussed **strategies to sustain interventions**, such as **sharing materials online**, collaborating to **adapt initiatives for other population groups**, **improving access to online training platforms**, and **creating tools or certifications** to encourage **further engagement or measure impact**
- Key **sustainability risks** include **limited funding** and the **potential loss of organisational knowledge** as teams on fixed-term contracts move on.

During the final round of evaluation interviews, interviewees discussed their plans to support the sustainability of at least one element of the interventions they had developed. These plans included actions they had taken or were intending to take, such as:

- (Continuing to) **share their materials** on online hubs, via events, networks or in response to requests from other ICBs or organisations (all pilots, including NU)
- **Working with system colleagues to identify applicability of interventions** to **other settings** (such as domiciliary care), **population groups** (such as younger adults, or adults with learning disabilities) or **links with other local strategic priorities** (such as addressing high dependency on acute care) particularly where participants considered pilot conditions to be more artificial than real-life applications (C&M, N&W, SE, SY)
- Identifying alternative, **more accessible platforms for sharing online training** suitable for social care staff with limited digital literacy or infrastructure, often relying on phones to access e-learning (N&W, NU) (see 3.2.2 Theme 7)
- **Commissioning films** to promote the pilot beyond the end of the pilot in ways not dependent on pilot team members (SE)
- **Creating tools** for organisations using the resources to **measure the impact** of their work by supporting easier data collection and analysis (SE)
- Following the NS example in developing **bronze, silver and gold certification** (SY).

However, the main risks that participants identified to the sustainability of their interventions were:

- The **lack of alternative funding** sources for continued work, given the financial pressures facing ICBs and the relative lack of priority given to improving hydration in local strategic plans
- **Loss of organisational knowledge or resources** to continue to promote the interventions as pilot teams move on from **fixed term contracts.**

"We're trying to put plans in place. So, even if the roles of the hydration team don't continue after the end of the pilot, all the resources and everything are there that everyone can still use to go on from that, like the website. And making sure that everything we've done just doesn't get lost and just disappear."

Box 5: Theme 5 pilot site example

In **SE** financial resources were set aside for sustainability. The pilot team attended local, regional and national events to raise awareness and share results of their local evaluation of the personalised hydration plan intervention. They also commissioned two films (one aimed at staff, another at patients) to continue to spread awareness and insights. Each (of the three) ICBs intended to share these alongside digital versions of the plan on either ICB or other local health-related websites. Regional teams within the SE can order physical resources beyond the end of the pilot. Finally, the SE team created an Excel tool to support organisations using the resources with patients to evaluate and demonstrate its impact, crucial for ensuring its long-term applicability and to continue to get buy-in from future audiences.

3.2.2 Impact on staff skills, knowledge and experience

Three themes from the qualitative findings can be mapped to this KLoE.

Theme 6 Addressing knowledge gaps about hydration

- Across the pilot sites, interviewees identified **educating stakeholders on the importance of hydration** in older people as a **crucial component** of any hydration intervention targeted at this audience
- Many pilot sites found a **surprisingly low baseline level of knowledge of good hydration** and limited awareness of the link between hydration status and the prevention of UTIs among care home staff and residents or members of the general public
- There was also **limited awareness in general practice** of more updated guidance for more accurately diagnosing UTIs.

Participants from all sites, including those testing digital tools or hydration plans in the South East, stressed that the key to successful hydration interventions was increasing knowledge or providing training on hydration, continence care, UTIs, and AMR.

Despite working with different target audiences, interview participants across the different pilots identified a similarly widespread inconsistent level of knowledge about:

- Positive health benefits of increased hydration for older people,
- How best to support people to increase their fluid intake
- How to prevent or respond to UTIs or prevent AMR.

They also shared specific insights about knowledge or awareness levels in different groups, including:

- **Care home managers and staff often overestimated their knowledge** and experience (or that of their staff), citing completion of existing training such as Care Certificate Standard Eight on fluids and nutrition (discussed by N&W interview participants). However, baseline assessments frequently revealed **basic gaps in staff knowledge.** (C&M, N&W, NU, SY)
- Care home staff in training sessions reported difficulties with **GPs still asking them to use urine dip-testing**, despite recent UK Health Services Authority (UKHSA) guidance advising against it because of the high risk of false positives and unnecessary antibiotic prescriptions for UTIs. (C&M, N&W, SY)
- Pilot sites working with **members of the public** found that they often thought they were drinking enough, didn't have a clear understanding of what it means to drink more or how to recognise dehydration, or were concerned that increased hydration means more trips to the toilet (SE, SW).

"Something that came through [the baseline survey], and that was part of the reason we ended up choosing education, was [that] a lot of [older people] don't know, [what drinking more means], 'We're told to drink more but what does 'more' mean and why?' I think that came up a lot, like …'Why drink enough? I don't feel thirsty.' You know, as you age, you don't feel as thirsty, so educating them that if they don't feel thirsty, it doesn't mean they're not thirsty or dehydrated."

Box 6: Theme 6 pilot site example

In **SWL**, more than 700 people attended a recent free webinar the ICB provided on hydration-related knowledge and care, which interviewees considered to indicate a significant skills or knowledge gap that health and care staff are keen to address. Even after they refocused their intervention from a smart cup to the #ButFirstADrink behavioural intervention, the pilot team maintained the engagement with the original 11 care home participants and recruited 17 more due to local enthusiasm for improving knowledge. The pilot team have plans to run an in-person conference focused on sharing learning and approaches to managing hydration as another element of their ongoing commitment to closing this gap.

Theme 7 Training formats and delivery modes

- Opinions varied on the **most suitable training mode**; trainers emphasised the **importance of in-person training for fostering deeper learning** and engagement while pilot leads and other stakeholders often **favoured online training for its accessibility and cost-effectiveness**
- **Blended approaches** combining face-to-face with online learning options provide an **effective compromise** if funding is available.

Interviews with staff delivering training across different pilot sites highlighted a clear preference for in-person sessions. Reasons included:

- Trainers' views that in-person sessions **allow for better engagement and interaction** among participants, greater flexibility to adapt to learners' needs, and more personalised answers to their questions (C&M, N&W, NU)
- **Care home staff are understood to dislike e-learning** (a view also expressed by care home interview participants), particularly due to the isolation and online fatigue associated with the shift to online meetings during the COVID-19 pandemic, making them disinclined to complete it if not mandatory (C&M, N&W)
- **Social care staff can struggle to access online learning platforms** that require fast broadband bandwidths to operate successfully, or are not compatible with mobile phone access, as laptop usage is not common on duty (N&W, NU).

However, when scaling up, pilot leads and other stakeholders identified several barriers to delivering face-to-face training:

- **Managing the complex logistics and high costs** of providing free in-person training to staff from more organisations, especially without additional funding (N&W, SY)
- **Workload pressures** and organisational attitudes that stopped staff from attending in-person events (as discussed in 3.2.1 Theme 3) (NU, N&W, SY)
- **High staff turnover**, creating a need for regular, ongoing training for new groups of staff (NS, N&W, NU).

Many interview participants recognised that a blended approach (combining online and in-person elements) best meets diverse needs and were either implementing this or working towards it at the time of final round evaluation interviews. Interviewees were particularly keen to provide online resources at a minimum as a legacy from their pilot, to ensure some level of sustainability.

"I think the blended approach of live online and then face-to-face is the gold standard. I love the idea of almost exclusively doing everything face-to-face, but we need to be realistic about people's availability, flexibility, and so many of our care staff now need to do training on their days off. They don't want to go into work on their days off, I wouldn't, personally. And I actually think the gold standard now is a blended approach between live online and face-to-face. "

Box 7: Theme 7 pilot site example

In **N&W,** the pilot team expanded their offer to 350 local care and nursing homes during phase three. The training company advocated for maintaining small, in-person, interactive sessions, as in phase one, to keep staff engaged and advised against e-learning for care home staff, based on their prior experience. However, with more potential participants, they agreed in-person sessions were less practical, especially as there was a lack of affordable venues large enough for the desired in-person sessions. Therefore, in phases two and three the pilot team introduced a blended approach, combining online and shorter in-person training sessions. There were initial challenges to delivering online content, as the Blackboard platform selected to host the materials did not work on care home staff's mobile phones and required laptop access (not possible for care home staff) but the team found alternative platforms. In the future, interviewees discussed the possibility of offering revised free online versions of the resources as a minimum, with the training company potentially providing paid-for face-to-face training to care homes seeking a more personalised approach.

Theme 8 Integrating interventions into usual practice

- To ensure **long-term impact and lasting change** in care staff competencies, pilot sites identified that it is essential to **integrate better hydration** practices into the **everyday operations** at all levels.
- This can require overcoming **internal cultural barriers** and **promoting strong hydration habits among staff**. System changes may be necessary, requiring **management's support** for effective training implementation.

Interview participants from several pilot sites highlighted that sustaining improvements in staff hydration care, especially (but not exclusively) in care homes, is dependent on organisational culture and management supporting staff to apply the changes promoted during training sessions.

Interviewees described several examples where staff raised significant concerns that internal attitudes to staff drinking while on duty (either from management, colleagues or visitors) or simply the large number of residents they support would, for example, prevent them from sharing drinks with residents as part of daily routines, for fear of being perceived as lazy and not professional.

Ways that pilot site teams attempted to address this included:

- **Involving staff from all departments** in training, including care workers and nurses, catering staff, activity co-ordinators and domestic staff, making good hydration among residents the responsibility of every staff member (C&M, NU, N&W, SY)
- **Involving management** in training sessions alongside frontline health and care staff to ensure that they are aware of what is being asked of staff and the organisational support required (NU, N&W,
- **Educating staff about their own hydration habits** and identifying ways this could be improved so that they model good drinking habits (C&M, N&W, SE)
- **Including visitors of care** home residents in training sessions to raise awareness of what good hydration-related care can involve, including sharing drinks with residents (C&M, N&W).

[The trainer] actually taken the training to the care homes. It's been open to all of the staff in the setting, and then just covering-, and all staff groups, really, so she's opened it out around whoever wants, you know, if they've got any of the wider MDT that are coming into the care home, she's opened the training out to them as well, so it's not just specifically to the healthcare support workers, it's the care home managers, if family members are around, whatever, you know, anybody who wants to come to the training, she's welcomed them in. You know, I think just really, that's what you can see, from the benefit of it on the residents and staff and their own family members, really.

Box 8: Theme 8 pilot site example

Despite including material about hydration culture, environments and policies in their intervention training packs, at the end of their implementation period, feedback collected by the pilot team at **NU** identified that staff were still not convinced that they had sufficient systemic support to implement changes (such as sufficient budget to introduce new drink and hydrating food options, or support from management to change care home policies). The pilot team concluded that without this, interventions like the one they developed would be unlikely to achieve long-term impact or sustainable embedded practice.

3.2.3 Outcomes of delivering pilot interventions

Three themes aligned with this KLoE, which cover the experience and outcomes of older people as reported by pilot teams.

Theme 9 Outcome measurement challenges

- **Data collection and measurement challenges** at the sites may be relevant only in the context of the Hydration Pilots programme rather than general implementation but should still be considered by any organisation which wishes to understand if their intervention has made a difference.

Some interview participants described difficulties collecting data aligned exactly with the metrics included in the evaluation's minimum dataset. These included:

- **Delays in application for section 251[10] support** which would enable more granular analysis of UTI-related admissions data by the ICB (NS)
- **Logistical challenges** for **ICBs signing data sharing agreements with all GP practices** supporting larger numbers of care homes or **organising access for all parties to resident shared care records** (C&M, N&W)
- **Broad (rather than UTI-specific) antibiotic prescribing practices** among GPs to mitigate for unclear symptoms, and AMR among older patients, undermining the utility of UTI-specific antibiotic measures (SY)
- **Primary care recording of falls in free text boxes** within patient records with **co-occurring diagnoses coded instead** (for example, UTI-related falls coded as UTIs and falls noted in text) (SE)
- Ambulance and hospital **admissions data that records queried diagnoses rather than confirmed diagnoses** due to delays in data updates following patient discharge (SY)
- Admissions data available **disaggregated by care home admission numbers or by diagnoses** but **not both** (SY)
- **Inconsistent demographics recording** and inability to disaggregate other metrics by ethnicity and socioeconomic groups (SE).

However, some interview participants discussed their views on how important these data collection issues were for their pilots or hydration interventions more generally in the future. The two different perspectives among this small group of interviewees were:

- Data collection issues may have limited their ability to meet the requirements of the national evaluation. However, **organisations implementing hydration interventions outside the pilot programme will be able to choose their outcome measures** that are easier to collect and set data collection periods that improve the chances of identifying results (N&W, SE, SW)
- Organisations introducing initiatives designed to improve practice, care or outcomes **should be able to demonstrate the impact** and therefore should consider lessons from the Pilot

[10] Section 251 of the National Health Service Act 2006 and its current Regulations, the Health Service (Control of Patient Information) Regulations 2002 allows the common law duty of confidentiality to be lifted temporarily to enable disclosure of confidential patient information for medical purposes.

programme, **find ways to improve data collection within their system** or **introduce tools to facilitate easier data collection** (SE).

[Without] a team of people pushing this and supporting [the intervention] the only way this is going to grow in the future … is if the people using it are enthusiastic about it and can talk about it. And actually, having data facilitates that because all clinical staff are expected to do improvement work, and to audit their work and things like that. So, you know, I felt it was really important to provide some sort of tool that would make it very easy for them to collect data so that they could fairly easily point at something and say, 'Look, we've started using this resource and our UTI rates, hopefully, have gone from X to Y.'

Box 9: Theme 9 pilot site example

In **N&W,** ICB Business Intelligence (BI) colleagues were able to collect hospital admissions and UTI-related admissions data throughout the pilot. However, prescribing data proved more challenging in the second year of the pilot. In the first two phases the ICB medicines management team were able to collect data relating to most homes (eight in phase one, 18 of 19 in phase two) as they were all supported by one of three GP practices (feeding into the same acute trust) who agreed to supply the data. However, in the second year of implementation, with the invitation to participate extended to 350 care homes, the medicines management team struggled to collect prescribing data because data sharing agreements were not signed with all supporting GP practices first.

Theme 10 Measuring fluid intake

- Interview participants **questioned how accurate data on participant fluid intake can be collected outside of academic or clinical trials**, highlighting care home reliance on proxy measures, the potentially unfeasible burden of collection on care homes or participants themselves, and unclear recording methods.
- They suggested **exploring data collection practices to assess intervention effectiveness** more reliably.

Interview participants also questioned whether it was realistic to expect pilot teams to accurately track fluid intake in care home residents or older adults living in the community. They expressed doubts about whether interventions could demonstrate improved hydration in terms of increased fluid uptake (rather than proxy measures). Their feedback highlights the need to explore how health and care teams should record data if an increase in fluid uptake is to serve as a measure of intervention success. Key points raised include:

- Interview participants suggested that care homes might struggle to provide this information due to the **burden of data collection** and added that **fluid intake is often estimated using proxies**, such as the number of drinks served, rather than measured accurately (SY)
- Pilot sites trialling **digital interventions** were particularly keen to do so to **help care homes improve how they record residents' fluid intake** (when they work) (C&M, NS, SWL)
- Interview participants from other pilot sites mentioned that some **care homes already record fluid intake using electronic care record systems**, though the exact measures these systems use were not clear (C&M, NS, N&W)
- For pilot sites working with the general public, the only measures available to them to measure changes in fluid intake among their participants were **self-report measures, which are prone to accuracy errors**. Sites found that some people reported drinking less after an intervention, which they potentially linked with **overestimations of their drinking at baseline** (SE, SW)
- One interview participant discussed that the **most accurate** (evidence-based) way to measure hydration levels is **through clinical analysis of blood samples,**[11] but that this would only likely be possible as part of a randomised controlled trial, with the support of GPs (N&W).

"We talked about [using]the best measure of hydration, which is serum osmolality, at some point, or doing a calculated version of that, which is pretty good diagnostically. And that would've actually let us know, essentially, whether we were increasing drinking…… So, [ideally] we would talk to the GPs about if they were seeing patients maybe they could also ask if they could take a blood sample. But if it was an RCT, people would've given consent to be involved, so there would be a whole different process involved."

Box 10: Theme 10 pilot site example

In **NS** the ROC app provided a structured method for care home staff to record the food and fluid intake of residents (based on 200ml measure of a full cup), using a traffic light system to record the resident's swallow (how well they can swallow food or fluids) and whether they need assistance or encouragement to drink. Care home managers can also access an online portal, linked to the ROC app, which provides an overview of the hydration levels of all residents in the home, and receive twice-daily notifications about residents who have reduced fluid intake and may be at risk of developing a urinary tract infection (UTI).

[11] Such as serum osmolality tests or other equations which can measure the balance of water and other substances within the blood, such as glucose, urea and electrolyte levels

Theme 11 Perceived and measured benefits for intervention participants

- While **not all sites were able to demonstrate statistically significant effects of their interventions** (See Section 4). interview participants remained encouraged by benefits of different interventions established in local evaluations and perceived by staff participating in or delivering interventions
- These **perceived benefits included improvements in other health outcomes and better hydration practices** among staff (as well as perceptions of reduced UTIs and falls).

Given the issues with data collection, some interview participants discussed that a statistically significant decrease in any of the national evaluation metrics was unlikely to be detected or attributable from their local data. Nevertheless, they emphasised the benefits for older people that interview participants either observed in care homes or people self-reported which included:

- **Changes in other health-related outcomes** such as fewer headaches, improvements in skin integrity (important for preventing pressure-related injuries), reduced constipation, improved energy and alertness and general wellbeing. (C&M, N&W, NS, SE, SWL, SW, SY)
- **Positive changes in good hydration practice.** Interviewees described examples of creative and improved hydration practice that they had witnessed amongst homes participating in the staff training-based pilots including snack trolleys, mocktail bars and dedicated days for talking about and experimenting with different hydration approaches (C&M, NS, N&W, SWL, SY).

While some interviewees described the lack of statistically significant outcome data as frustrating and disappointing for pilot leads and teams working hard to implement change, others were satisfied with the results of local evaluations, feedback received from staff and other participants and their local data analysis which indicated at least a potential link to changes in outcomes among care home residents, including reduced UTIs and falls.

"Nobody can clinically quantify those outcomes [due to small numbers], which is annoying but it is what it is but, that being said, there is a definite link. Because we analyse the information, particularly around falls, obviously around infection rates…we look at that data on a monthly basis and we drill really into the [data] and there is a definite link. There is a definite reduction which ties in with the implementation of the rollout [of the pilot]."

Box 11: Theme 11 pilot site examples

In the **South East**, the team developed an interactive Excel-based dashboard to visualise the results of the baseline and review surveys they asked all patient participants to complete. This included demographic data, self-report measures of hydration levels, UTI rates and falls. They also asked participants to rate their quality of life across six indicators, which showed a small average increase across all six (mobility, self-care, usual activities, pain or discomfort, anxiety or depression and overall health) after participants completed the diary.

4. Impact evaluation

This section presents the overall impact findings, followed by a summary of findings from the ITS analyses for each of the pilot sites. For more details of individual hydration pilot findings please refer to case studies in Annex 6. Note that it is not possible to make comparisons between pilots due to the different data sources and metrics provided by pilot sites (Table 4.1).

4.1 Overall impact findings

The impact analyses suggest that across the hydration pilot sites, interventions to improve hydration status in older people have the potential to achieve the intended outcomes. A summary of impact findings (for the metrics where ITS analysis was feasible) is provided in Table 4.1. A comparison across pilots is not possible due to differences in data collected at each site (see Table 4.1). Impact findings should be interpreted with caution (see limitations section 2.5).

Four of the seven hydration pilots, C&M, NS, SW and SY, all showed statistically significant improvements in one or more of their metrics. Detailed impact findings for each hydration pilot sites can be found in section 4.2-4.8 and in individual case study site reports (Annex 6). The tables show the absolute difference between the pilot site and the counterfactual per month. The summaries also include the relative percentage difference. This is shown as the impact of the local intervention. Each metric has a different unit of measurement that is defined in table 2.2 in section 2.4.

The main statistically significant findings are:

- Two pilots, NS and SY, showed decreased UTI diagnoses
- Two pilots, C&M and SY, showed decreased antibiotic prescribing
- Three pilots, C&M, NS, and SW showed reductions in both emergency admissions for UTIs and falls.

Table 4.1 **Summary ITS findings.** Note that metric definitions at pilots vary and are not directly comparable.

Metric name	C&M[12] Staff training / drinks round	N&W[13] Staff needs assessment / training	NS Fluid intake monitoring app	SE Personal hydration plan / diary	SW Public facing educational resources	SWL[14] Staff training / behavioural change	SY Staff training / drinks round
Number of UTI diagnoses per 100 patients per month							
Percentage of increased fluid intake from baseline per 100 patients per month							
Prescriptions of an antibiotic commonly used for UTI per 100 patients per month [15]							
Emergency admissions to hospital due to UTI per 100 patients per month							
Number of falls \ Falls-related admissions per 100 patients per month							
Number of ambulance call-outs for UTIs per 100 patients per month							
Number of ambulance conveyances per 100 patients per month							
Number of ED attendances for UTIs per 100 patients per month							
E.coli rates per 100 patients per month							

[12] C&M also implemented a Smart cup for use in care homes in Year 1 only.
[13] N&W also collected data on the falls and UTI diagnoses metrics, but the numbers were too small to analyse
[14] SWL also implemented a Smart cup for use in care homes in Year 1 only.
[15] SY provided data on all antibiotics prescribed rather than only those commonly prescribed for UTIs

Metric name	C&M[12] Staff training / drinks round	N&W[13] Staff needs assessment / training	NS Fluid intake monitoring app	SE Personal hydration plan / diary	SW Public facing educational resources	SWL[14] Staff training / behavioural change	SY Staff training / drinks round
All-diagnosis hospital admissions per 100 patients per month							

Key

	Significant increase in all phases		Significant decrease in all phases		Excluded due to small numbers
	Significant increase in some phases		Significant decrease in some phases		
	No impact **or** mixed results		Metric not measured		

4.2 Cheshire and Merseyside (staff training / range of interventions[16])

The C&M pilot started in February 2024. The pre-period used was April 2022 to January 2024 and the post-period was February 2024 to October 2024.The key findings from the ITS analyses of the C&M pilot are shown in Table 4.2.

Table 4.2 C&M ITS findings

Metric name	Impact
Emergency admissions to hospital due to UTI in the over-65s population per 100 patients per month	-11.8
Emergency admissions to hospital due to UTI per 100 patients per month	-2.2
Falls related admissions per 100 patients per month	-9.8*
Prescriptions of an antibiotic commonly used for UTI[17] per 100 patients per month	-14.9*
E.coli rates per 100 patients per month [18]	1.7

* statistically significant at 95% level

For C&M, the results of the ITS indicates that the hydration pilot intervention had a mixed effect:

- The statistically significant changes were:
  - 9.8 fewer falls related admissions (per 100 patients per month), representing a decrease of 19.3%
  - 14.9 fewer combined antibiotic items prescribed to patients aged 70 years and over (per 1,000 list size for patients aged 70 years and over), representing a decrease of 3.9%.

These findings should be interpreted with caution as

- A downward trend in falls related admissions has been recorded nationally since July 2023[19]. This means the effect of confounding factors cannot be ruled out in C&M hydration pilot finding of a reduction in falls
- Qualitative data indicates that in C&M ICS there were wider efforts to reduce overprescribing of antibiotics, which may have impacted the rates of antibiotic prescribing system-wide. However,

[16] C&M also implemented a Smart cup for use in care homes in Year 1 only.
[17] Combined antibiotics items prescribed to patients aged 70 years and over per 1,000 list size
[18] This metric was collected locally but not part of the requested dataset
[19] Secondary Uses Service (SUS) data extracted in January 2025

it was reported that ICS areas participating in the hydration pilot had lower rates of antibiotic prescribing for UTIs compared to those not participating.

4.3 Norfolk and Waveney (staff needs assessment / training)

The N&W hydration pilot was implemented in three phases, to allow for phased recruitment of care homes. Hospital admission data was collected for year 1 and phase 2: Year 1 = 8 residential homes (Oct 22- Sept 23), Phase 2 = 19 nursing homes (Jan 24 – March 24). The pre-period used in the analysis was April 2022 to February 2023 and the post-period was March 2023 to July 2024.

Of the metrics collected by N&W, ITS analysis was only feasible for the 'all diagnosis hospital admissions' metric. For the falls and UTI diagnoses metrics, it was not possible to conduct an ITS, as the incidences each month were small (0-1).

Table 4.3 N&W ITS findings

Metric name	Impact
All diagnosis hospital admissions **per 100 patients per month** [20]	-1.8

* statistically significant at 95% level

At N&W, the ITS analysis demonstrated that there were 1.8 (per 100 patients per month) fewer all diagnosis hospital admissions in the post-intervention period; however this finding was not statistically significant.

4.4 Nottinghamshire (fluid intake monitoring app)

The NS hydration pilot was implemented in two phases and eight quarter waves to allow for phased recruitment and onboarding of care homes (three waves in the first phase, five in the second), reaching a peak of 23 participating homes. Whilst the intervention period across the eight waves varied, the intervention start date was March 2023 across all waves and metrics (see Table 4.4 for data coverage period for the relevant metrics).

Aggregated ITS analysis was undertaken across the two phases and eight waves to reduce the effect of small numbers on the findings. Data from the care homes not involved in the pilot were included to provide a control for developing the counterfactual. Table 4.4 below shows the pre-period and post-period for the four metrics analysed.

[20] This metric was collected locally but not part of the requested dataset

Table 4.4 Data coverage for pre- and post-intervention periods

Metric name	Pre-intervention period	Post-intervention period
Number of UTI diagnoses per 100 patients per month [21]	April 2022 to February 2023	March 2023 to April 2024
Emergency admissions to hospital due to UTI per 100 patients per month	July 2021 to February 2023	March 2023 to June 2024
Prescriptions of an antibiotic commonly used for UTI per 100 patients per month	April 2021 to February 2023	March 2023 to August 2024
Falls related admissions per 100 patients per month	April 2019 to February 2023	March 2023 to June 2024

The key findings from the ITS analyses of the NS pilot are shown in Table 4.5.

Table 4.5 NS ITS findings

Metric name	Impact
Number of UTI diagnoses per 100 patients per month[22]	-9.3*
Emergency admissions to hospital due to UTI per 100 patients per month	-0.4
Prescriptions of an antibiotic commonly used for UTI per 100 patients per month	47.7*
Falls related admissions per 100 patients per month	-8.0*

* statistically significant at 95% level

For NS, the results of the ITS indicates that the hydration pilot intervention had a mixed effect:

- The statistically significant changes were:
  - 9.3 fewer UTI diagnoses (per 100 patients per month), representing a decrease of 73%
  - 8.0 reduction in falls (per 100 patients per month) representing a decrease of 25%. One care home was also part of a falls reduction project simultaneously with the Hydration pilot, which may have impacted the falls metric.
  - 47.7 more antibiotic prescriptions (per 100 patients per month) representing an increase of 34%. This appears to be related to an overall increase in antibiotic prescribing across Nottinghamshire, but it was not possible to validate this theory.

[21] UTI primary diagnosis
[22] UTI primary diagnosis

- There was also a non-significant reduction in UTI primary non-elective hospital admissions.

The project team provided some context to explain their findings. There were varying levels of engagement from the care homes that participated. Not all patients in the care homes participated in the pilot, even if the care home was signed on and using the ROC app. This may dilute any impact the intervention may have delivered.

4.5 South East (personal hydration plan/diary)

Although the SE regional hydration pilot was implemented in three quality improvement Plan-Do-Study-Act (PDSA) cycles, the data was analysed in four phases, to account for the different Primary Care Network (PCN) start dates. Table 4.6 below shows the areas covered, pre-period and post-period for the four phases analysed.

Table 4.6 South East implementation details

Phase	Coverage	Pre-intervention period	Post-intervention period
1	Bexhill	October 2022 to September 2023	December 2023 to July 2024
2	Frimley, Redhill and Crawley	April 2023 to March 2024	April 2024 to August 2024
3	Crawley South	July 2023 to June 2024	July 2024 to September 2024
4	Healthy Horley	August 2023 to July 2024	August 2024 to September 2024

The key findings from the ITS analyses of the SE pilot are shown in Table 4.7.

Table 4.7 South East Region ITS findings

Metric name	Phase one impact	Phase two impact	Phase three impact	Phase four impact
Number of UTI diagnoses **per 100 patients per month** [23]	5.0*	0.3	26.9*	-3.9*
Prescriptions of an antibiotic commonly used for UTI **per 100 patients per month** [24]	-2.5*	-1.5*	10.0*	-0.7
Number of ED attendances for UTIs **per 100 patients per month** [25]	0.8	1.8*	0.5	-0.4
Emergency admission to hospital due to UTI per 100 patients per month [26]		0.6		-1.0

* statistically significant at 95% level

For the SE region, the results of the ITS indicates that the hydration pilot intervention had a mixed effect:

- A statistically significant change in UTI diagnoses (per 10,000 patients per month) in three phases:
  - In phase four there were 3.9 fewer UTI diagnoses, representing a decrease of 53%
  - In phase one there were 5.0 more UTI diagnoses, representing an increase of 27%
  - In phase three there were 26.9 more UTI diagnoses, representing an increase of 131%
- A statistically significant change in antibiotic prescribing (per 10,000 patients per month) in three phases:
  - In phase one there were 2.5 fewer antibiotics prescribed, representing a decrease of 6%

[23] Number of UTI diagnoses during the month per 10,000 patients on the caseload
[24] Rates of antibiotic prescriptions commonly prescribed for UTI's during the month per 10,000 patients on the caseload
[25] Number of patients who had an emergency attendance due to a UTI during the month per 10,000 patients on the caseload
[26] Number of patients who had an emergency admission due to a UTI during the month per 10,000 patients on the caseload

  - In phase two there were 1.5 fewer antibiotics prescribed, representing a decrease of 7%
  - In phase three there were 10.0 more UTI diagnoses, representing an increase of 16%
- A statistically significant increase in emergency attendance due to a UTI (per 10,000 patients per month) in one phase:
  - In phase two there were 1.8 more emergency attendance due to a UTI, representing an increase of 200%

Discussions with pilot site data leads suggest that the increase in the number of UTI diagnoses was an artefact linked to site improvements in capturing data (see Limitations section for further details).

4.6 South West (public facing educational campaign)

The first year of the SW regional hydration pilot was implemented in a single phase and covered three areas (Devon, Somerset, and Dorset) and started in July 2023. The pre-period used was July 2022 to July 2023 and the post-period was August 2023 to May 2024.

The key findings from the ITS analyses of the SW pilot are shown in Table 4.8.

Table 4.8 South West Region ITS findings

Metric name	Impact
Emergency admission to hospital due to UTI per 100 patients per month	-31.8*
Falls related admissions per 100 patients per month	-60.7*

* statistically significant at 95% level

In the SW, the results of the ITS indicates that the hydration pilot intervention had a statistically significant effect on the two outcome variables (falls and non-elective admissions).

- The statistically significant changes were:
  - 31.8 fewer UTI non-elective admissions (per 100 patients per month), representing a decrease of 22%
  - 60.7 fewer falls related admissions (per 100 patients per month), representing a decrease of 19%

Discussions with pilot site data leads suggests that the findings are likely to be confounded by another intervention within the Dorset ICS. Findings should also be interpreted in the context of the national downward trend in falls-related admissions.

4.7 South West London (staff training / behavioural change)[27]

The South West London hydration pilot was implemented in seven phases at 28 care homes, for which there was data available for 19. The data for each phase were analysed separately to account for the different start dates. Table 4.9 below shows the areas covered and the pre- and post-periods for phases analysed. Note it was not possible to perform ITS analysis for phase one (Croydon 5) due to small numbers of incidences available for analysis.

Table 4.9 SWL implementation details

Phase	Coverage	Pre-intervention period	Post-intervention period
2	Kingston 3, Kingston 4, Merton 3, Sutton 2 and Wandsworth 2	March 2023 to March 2024	April 2024 to November 2024
3	Merton 2 and Sutton 1	April 2023 to April 2024	May 2024 to November 2024
4	Croydon 8, Kingston 2, Richmond 1 and Wandsworth 1	May 2023 to May 2024	June 2024 to November 2024
5	Croydon 2 and Richmond 2	June 2023 to June 2024	July 2024 to November 2024
6	Croydon 7 and Merton 1	July 2023 to July 2024	August 2024 to November 2024
7	Merton 5, Croydon 6, Kingston 6 and Kingston 5	August 2023 to August 2024	September 2024 to November 2024

The key findings from the ITS analyses of the South West London pilot are shown in Table 4.10.

[27] SWL also implemented a Smart cup for use in care homes in Year 1 only.

Table 4.10 SWL ITS findings

Metric name	Phase two impact	Phase three impact	Phase four impact	Phase five impact	Phase six impact	Phase seven impact
Number of UTI diagnoses per 100 patients per month[28]	-0.6	-0.3	2.8*	2.7	-4.7*	-0.6
Number of falls per 100 patients per month[29]	5.4*	3.5*	2.2	9.3*	-7.5*	2.5
Number of ambulance incidents per 100 patients per month	11.1*	-2.3	-3.9*	4.5*	-4.9	2.7
Number of ambulance conveyances per 100 patients per month	6.8*	-0.4	-3.0	3.4*	-3.6	1.9

* statistically significant at 95% level

For SWL, the results of the ITS indicates that the hydration pilot intervention had a mixed effect:

- A statistically significant change in UTI diagnoses (per 100 patients per month) in two phases:
  - In phase six there were 4.7 fewer UTI diagnoses, representing a decrease of 67%
  - In phase four there were 2.8 more UTI diagnoses, representing an increase of 53%
- A statistically significant change in falls (per 100 patients per month) in four phases:
  - In phase six there were 7.5 fewer falls related admissions, representing a decrease of 100%
  - In phase two there were 5.4 more falls related admissions, representing an increase of 146%
  - In phase three there were 3.4 more falls related admissions, representing an increase of 103%
  - In phase five there were 9.3 more falls related admissions, representing an increase of 42%
- A statistically significant change in ambulance incidents (per 100 patients per month) in three phases:
  - In phase four there were 3.5 fewer ambulance incidents, representing a decrease of 12%

[28] Number of UTI diagnoses during the month per 100 patients on the caseload
[29] Number of patients who had a fall during the month, regardless of whether they were admitted to hospital per 100 patients on the caseload

  - In phase two there were 11.1 more ambulance incidents, representing an increase of 78%
  - In phase five there were 4.5 more ambulance incidents, representing an increase of 48%
- A statistically significant change in ambulance conveyances (per 100 patients per month) in two phases:
  - In phase two there were 6.8 more ambulance conveyances, representing an increase of 62%
  - In phase five there were 3.4 more ambulance conveyances, representing an increase of 37%

The numbers in each phase were relatively small (numerators often less two per month for all four metrics). This could have affected the results; therefore, they should be treated with caution.

Local analysis suggests that there has been a reduction in ambulance attendances and conveyances. This could not be verified by the impact analysis, although this could be related to the short time post-intervention some phases had to demonstrate impact. A future analysis when all the phases have been embedded may produce different results.

4.8 South Yorkshire (staff training / range of interventions)

The SY hydration pilot was implemented in several phases to allow for the staggered recruitment of participating care homes. Separate ITS analyses were undertaken for two of these phases to account for the different pre- and post-intervention periods.[30] Table 4.11 below shows the number of care homes covered, pre-period and post-period for the two phases analysed.

Table 4.11 South Yorkshire implementation details

Phase	Coverage	Pre-intervention period	Post-intervention period
1	4 care homes	January 2022 to December 2022	January 2023 to March 2024.
2	6 care homes	April 2022 to March 2023	April 2023 to March 2024.

The key findings from the ITS analyses of the South Yorkshire pilot are shown in Table 4.12.

[30] These phases were those which provided 12 months of post-intervention related data

Table 4.12 South Yorkshire ITS findings

Metric name	Phase one impact	Phase two impact
Number of UTI diagnoses per 100 patients per month	-1.8*	-0.8*
Prescriptions of antibiotics (not specifically for UTI) per 100 patients per month	-4.3*	-1.2*
Number of ambulance callouts (not specifically for UTI) per 100 patients per month	2.0*	-2.7*

* statistically significant at 95% level

The ITS analyses findings demonstrate:

- A statistically significant decrease in UTI diagnoses (per 100 patients per month) in both phases:
  - In phase one there were 1.8 fewer UTI diagnoses, representing a decrease of 62%
  - In phase two there were 1.2 fewer UTI diagnoses, representing a decrease of 44%.
- A statistically significant decrease in antibiotic prescriptions (per 100 patients per month; not specifically for UTI) in both phases:
  - In phase one there were 4.3 fewer antibiotic prescriptions, representing a decrease of 24%
  - In phase two there were 1.2 fewer antibiotic prescriptions. representing a decrease of 8%
- Statistically significant changes in ambulance callouts (per 100 patients per month; not specifically for UTI:)
  - In phase one there were 2.0 more ambulance callouts, representing an increase of 21%.
  - In phase two there were 2.7 fewer ambulance callouts, representing a decrease of 16%.

There were no known additional limitations with the South Yorkshire analysis. Therefore, we can be reasonably confident in the results.

5. Conclusions and recommendations

5.1 Conclusions

The findings of the evaluation allow for the following conclusions on whether the Hydration Pilots programme met its aims (see section 1.1).

5.1.1 Did the programme support the development of an evidence base on the effect of hydration on the prevention of UTIs?

Data from some pilot sites did show positive statistically significant trends in UTI, antibiotic and falls-related metrics including:

- Two pilots, NS and SY, showed decreased UTI diagnoses
- Two pilots, C&M and SY, showed decreased antibiotic prescribing (but not UTI-specific)
- Three pilots, C&M, NS, and SW showed reductions in both emergency admissions for UTIs and falls.

However, limitations in data collection, such as variations in available metrics (see table 2.2 for data definitions and sources), and difficulties in measuring fluid intake means the evaluation cannot conclude definitively that the positive trends for UTI prevention seen at some pilots were a direct result of the specific hydration-focused intervention. It is possible that other local factors which were not measured as part of this evaluation, may have contributed to the positive trends.

5.1.2 Did the programme inform the choice of hydration interventions that will support the overall aim of reduction in HA-GNBSIs, antimicrobial prescribing and resistance?

The programme offered valuable insights into the successes and challenges of implementing hydration-related interventions at an ICB or regional level. However, as above, the Hydration Pilots national programme design and the flexibility of the evaluation design to accommodate implementation changes also prevented comparisons between interventions; pilot sites worked with different target audiences, in different settings and involving different numbers of participants.

5.1.3 Did the programme demonstrate any improvement arising from the interventions, particularly that which is sustainable and reproducible in other localities?

Despite the challenges in measuring outcomes and firmly attributing improvements to the interventions, the majority (except for the discontinued smart cups) showed at least potential to contribute to improvements. This included health and wellbeing outcomes for older people and, unexpectedly, staff, as they reflected on their own hydration levels, as well as improved hydration-related practice among staff. This was enough to convince many interview participants from across the pilot sites of the value of the different interventions. The sustainability of these improvements will depend on the extent to which local systems continue to implement or support the interventions and promote wider use. For organisations planning to implement any of the

interventions tested in the programme, recommendations in the next section outline how to anticipate and address challenges encountered by pilot sites and potentially reproduce similar improvements. There are also suggestions for relevant national teams to consider, focusing on future or follow-up actions relating to improving hydration among older people or other populations, or preventing HA-GNBIS and AMR.

Overall, the Hydration Pilots programme provided significant learning opportunities and revealed the complexities of implementing hydration interventions. Despite challenges in attributing specific results, it underscored the importance of tailored approaches, incorporating evaluation aims into programme or intervention design, and addressing systemic barriers to optimise the impact of future initiatives.

5.2 Recommendations

Table 5.1 outlines some recommendations which align with the thematic findings. These were also developed based on an analysis of pilot site experiences using the NPT domains of coherence, cognitive participation, collective action and reflexive practice. Further details on how the recommendations fit these domains is included in Annex 5. The national recommendations are aimed at different teams, within the scope of their respective responsibilities, considering any further actions on improving hydration in care settings, among older people or other populations.

Table 5.1 Recommendations for future implementation of pilot site interventions

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
Theme 1 • Locally led design or selection of interventions at pilot sites fostered local stakeholder engagement and buy-in • Lack of a centralised process for reviewing educational content may have caused inconsistencies in content between pilots,	• **Include time in implementation schedule for consensus building** or developing shared understanding with target audience that an intervention is needed • **Adapt (even existing) training and resources** to resonate with local contexts and workforce requirements, ensuring interventions feel relevant and practical.	• **Review how hydration is covered in mandatory training for health and care staff** – potentially working with Skills for Care and Skills for Health to review Care Certificate Standard Eight, but also any future alternative • **Develop a standardised content framework** for ICBs or other quality assurance materials for ICBs to review their own adapted interventions to ensure quality and consistency.

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
Theme 2 • Co-production with care home residents and staff to develop hydration interventions was valued across pilot sites but not fully delivered by any pilot • Co-production challenges in these pilots (relevant to similar interventions) included first-year timelines which limited the time available for co-production and implementation, workload pressures preventing staff from fully engaging in co-production decisions and difficulties involving frail care home residents.	• **Actively involve care home managers, staff, and target populations** in co-designing interventions to ensure alignment with their needs and preferences • **Where possible, co-produce all elements of implementation, not just co-design,** with target audience such as baseline survey, design or selection process, reviewing and refining training materials, engaging other members of target audience.	• **Consider whether future programme timescales are suitable for co-production** and steer participants accordingly in programme and/or grant criteria • **If sufficient time available for co-production as part of future programmes, signpost to existing national guidance** on co-design and co-production as appropriate to staff, target population and setting.
Theme 3 • Recruiting and engaging participants at pilot sites, especially care home and PCN staff, proved challenging due to staff workload pressures and schedules • Successful delivery of interventions in this setting and participant group is dependent on effective strategies for encouraging and maintaining participation, such as realistic	• **Scope out potential barriers to engagement** including digital infrastructure limitations, conflicting or parallel programmes making demands on same staff groups, and risk manage them through the lifetime of the intervention	• **Develop national-level communication materials** to raise awareness about hydration's importance and highlight different interventions, making it easier for ICBs to engage local stakeholders and the public.

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
timescales, in-person engagement or tiered accreditation to encourage competition between participants	• **Start small, conduct user testing and stagger implementation** to test reception to the intervention and anticipate any barriers to engagement among wider pool of participants, including sufficient resource for troubleshooting • **Leverage word-of-mouth promotion** by encouraging early participants to share their positive experiences to boost engagement among other staff and settings.	
Theme 4 • Digital interventions can effectively help with measuring and recording hydration alongside training but must integrate smoothly with existing electronic care systems. • Collaborating with small startup organisations carries risks and potential high costs, making it advisable to start with smaller scale initiatives.	• **Plan for targeted support and training to care home staff with low digital literacy**, ensuring online materials and tools are accessible. • **Conduct due diligence of any SMEs providing digital tools**	• **For future programmes funding digital interventions in social care, review technical feasibility of bids** ensuring they include sufficient contingency for addressing any likely digital infrastructure issues.

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
	and ensure contracts sufficiently cover organisations for impact of risks.	• **Provide an independent steer on the applicability of a digital intervention**, for example through requesting a critical appraisal of any new technology to be used in the target setting.
Theme 5 • Interviewees discussed strategies to sustain interventions, such as sharing materials online, collaborating to adapt initiatives for other population groups, improving access to online training platforms, and creating tools or certifications to encourage further engagement or measure impact. • Key sustainability risks include limited funding and the potential loss of organisational knowledge as teams on fixed-term contracts move on.	• **Work with ICB senior management to keep hydration on their radar** as a strategic area for action • **Offer a range of potential interventions for different settings and budgets** to encourage adoption and sustainability. • **Consider from the beginning how the intervention may be sustained with minimal additional resources** and	• **Continue to embed a 'prevention first'** approach, integrating preventative care across the entire system

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
	identify potential mitigation strategies	
Theme 6 • Across the pilot sites, interviewees identified educating stakeholders on the importance of hydration in older people as a crucial component of any hydration intervention targeted at this audience • Many pilot sites found a surprisingly low baseline level of knowledge of good hydration and limited awareness of the link between hydration status and the prevention of UTIs among care home staff and residents or members of the general public • There was also limited awareness in general practice of more updated guidance for more accurately diagnosing UTIs.	• **Engage with GPs** to ensure workforce adhere to best practice diagnostic guidelines (for example discouraging dipstick testing)	• **Work with other relevant agencies like CQC, RCGP, CSO and UKHSA and relevant NHSE teams to further socialise** guidance on dipstick testing and ensure all local health partners are working in the same way to improve hydration
Theme 7 • Opinions varied on the most suitable training mode; trainers emphasised the importance of in-person training for fostering deeper learning and engagement while pilot leads and other stakeholders often favoured online training for its accessibility and cost-effectiveness.	• **Offer flexible, blended training options** (in-person and online) to accommodate staff schedules and work demands, while ensuring e-learning components are	• **Provide national guidance on delivering educational initiatives in care home settings** on upskilling care home staff, learning from this pilot and

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
• Blended approaches combining face-to-face with online learning options provide an effective compromise if funding is available.	effective and complement in-person sessions. • **Consider sequencing of in-person and online training elements** to allow for different levels of engagement or participation.	a synthesis of the relevant evidence-base**.**
Theme 8 • To ensure long-term impact and lasting change in care staff competencies, pilot sites identified that it is essential to integrate better hydration practices into the everyday operations at all levels. • This can require overcoming internal cultural barriers and promoting strong hydration habits among staff. System changes may be necessary, requiring management's support for effective training implementation.	• **Continue to work with health and care settings to address any organisational or systemic barriers** such as staff shortages, costs of implementing changes, and internal cultural barriers.	• **Review and update existing NHS England guidance** on good commissioning of hydration care to ensure it captures learning the from pilots.
Theme 9 • Data collection and measurement challenges at the sites may be relevant only in the context of the Hydration Pilots programme rather than general implementation but should	• **Work with ICB BI teams** to identify what UTI-related data is available and make this easily accessible, addressing barriers	• **Conduct further review of the barriers** in the health and care system preventing health and care partners sharing relevant

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
still be considered by any organisation which wishes to understand if their intervention has made a difference.	where they are identified to encourage a whole-system approach	metric data which would enable sites to monitor effectiveness of hydration interventions
Theme 10 • Interview participants questioned how accurate data on participant fluid intake can be collected outside of academic or clinical trials, highlighting care home reliance on proxy measures, the potentially unfeasible burden of collection on care homes or participants themselves, and unclear recording methods. • They suggested exploring data collection practices to assess intervention effectiveness more reliably.	• **Work with care homes or other relevant organisations to improve fluid recording**, potentially with the support of (well-established) digital tools	• **Before launching programmes, commission feasibility studies** to establish the standardised metrics it is possible to collect across different health and care settings or what support systems require to collect them. • **Consider any opportunities for sharing insights** from any existing academic trials of specific hydration-related interventions to raise awareness of evidence-base

Findings	Recommendations for organisations considering implementation	Recommendations for any national teams considering future programmes or actions
Theme 11 • While not all sites were able to demonstrate statistically significant effects of their interventions interview participants remained encouraged by the perceived benefits of different interventions • These benefits included improvements in other health outcomes and better hydration practices among staff (as well as perceptions of reduced UTIs and falls).	• **(Continue to) monitor quantitative outcomes** of interventions to understand their effectiveness over time • **Select and monitor qualitative outcomes** or collect personal stories from older people who have improved their hydration to demonstrate the value of interventions.	• **Provide resources, or step by step guidance on evaluating** effectiveness of hydration interventions such as interactive dashboard templates. • **Continue to facilitate shared learning spaces** where staff with ongoing interest in hydration can continue to share good practice after the pilots finish.

6. Bibliography

Links to the following documents were included in the text:

World Health Organisation (undated) *Antimicrobial resistance,* Available at: https://www.who.int/health-topics/antimicrobial-resistance (Accessed March 2025)

Review on Antimicrobial Resistance (2016). *Tackling drug-resistant infections globally: final report and recommendations.* Available at: https://amr-review.org/ (Accessed March 2025)

Department of Health and Social Care, (2019) *UK 5-year action plan for antimicrobial resistance 2019-2024.* Available at: https://www.gov.uk/government/publications/uk-5-year-action-plan-for-antimicrobial-resistance-2019-to-2024 (Accessed March 2025)

Fasugba O, Mitchell BG, McInnes E, Koerner J, Cheng AC, Cheng H, Middleton S. (2020) Increased fluid intake for the prevention of urinary tract infection in adults and children in all settings: a systematic review. *The Journal of Hospital Infection*. Vol.104, No.1, pp 68-77. Available at doi: 10.1016/j.jhin.2019.08.016 (Accessed March 2025)

McCollum BJ, Garigan T, Earwood J. (2020) PURL: Can drinking more water prevent urinary tract infections? *Journal of Family Practice.* Vol. 69, No.3, E19-E20. Available online at: https://pubmed.ncbi.nlm.nih.gov/32289134 (Accessed March 2025)

Department of Health and Social Care (2022) Tackling antimicrobial resistance 2019 to 2024: addendum to the UK's 5-year national action plan. Available at: https://www.gov.uk/government/publications/addendum-to-the-uk-5-year-action-plan-for-antimicrobial-resistance-2019-to-2024 (Accessed March 2025)

Department of Health and Social Care and Public Health England (2021) APRHAI: summary of activities and recommendations, January to December 2019. Available at: https://www.gov.uk/government/publications/aprhai-summary-of-activities-and-recommendations/aprhai-summary-of-activities-and-recommendations-january-to-december-2019 (Accessed March 2025)

Murray, E., Treweek, S., Pope, C. et al. (2010) Normalisation process theory: a framework for developing, evaluating and implementing complex interventions. BMC Med 8, 63 https://doi.org/10.1186/1741-7015-8-63 (Accessed March 2025)

Skills for Care, Health Education England and Skills for Health (undated) *The Care Certificate Standards* Available online at: https://www.skillsforcare.org.uk/resources/documents/Developing-your-workforce/Care-Certificate/The-Care-Certificate-Standards.pdf (Accessed March 2025)

UK Health Services Authority (UKHSA) *Guidance: Urinary tract infection: diagnostic tools for primary care*. Available at: https://www.gov.uk/government/publications/urinary-tract-infection-diagnosis (Accessed March 2025)

NHS England (2015) *Guidance – Commissioning Excellent Nutrition and Hydration 2015 – 2018* Available at: https://www.england.nhs.uk/wp-content/uploads/2015/10/nut-hyd-guid.pdf (Accessed March 2025)

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