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Synopsis

Intervening to eliminate the centre-effect variation in home dialysis use: a synopsis of Inter-CEPt, an exploratory sequential mixed-methods study

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Abstract

Background: There is a substantial variation in the use of home dialysis between kidney services, which disproportionally affects people from ethnic minorities and socioeconomically deprived areas.
Objective: To create an evidence-based, user-centred intervention, enabling kidney services to optimise access to home dialysis, thereby eliminating unwarranted centre-level variation in its uptake.
Design and methods: We used exploratory, sequential mixed-methods to understand the centre-level characteristics associated with home dialysis use: an ethnography study to explore the organisational and cultural factors associated with home dialysis use that informed a national survey of centre-level characteristics from all kidney services in England, and quantitative analysis (sequence of regressions) to determine the factors associated with increased odds of going on home dialysis. A multistate model was constructed to determine transitions between dialysis modalities, transplantation and death. A health economic model, drawing upon the multistate model, estimated the quality-adjusted life-years and National Health Service costs over a patient's lifetime. A user-centred iterative intervention design method to interpret the findings and identify components for a service-level intervention, coproduced with relevant stakeholders (patients, families/carers, doctors, nurses, policy makers and industry).
Setting and participants: Ethnography: Four centres, 43 observations of consultations, meetings and education sessions; 72 patient and staff interviews.
Main outcome measure: Being on dialysis at home within 12 months of starting treatment.
Data source: United Kingdom Renal Registry: Sequence of regressions: 32,400 patients initiating dialysis 2015–20; multistate model: 93,452 initiating dialysis 2005–20; the economic evaluation simulated a cohort of 2000 patients.
Results: Both the ethnography and the national surveys found that organisational culture and leadership were more closely associated home dialysis uptake than how services were organised. Several centre-level factors were found to be important [odds ratio (95% confidence intervals: of being on home dialysis by 1 year)], including: engagement in quality improvement, 1.94 (1.36 to 2.76), availability of assisted peritoneal dialysis, 1.89 (1.39 to 2.57) and a negative association with Home Dialysis staff capacity 0.60 (0.45 to 0.81). Initiating dialysis at home yielded an additional 0.30 quality-adjusted life-years and saved £13,545 compared centre dialysis. Components of the proposed 'Location of Dialysis Care in Kidney Life' intervention include engagement with targeted quality improvement, the implementation of leadership roles to embed organisation culture, use of assisted peritoneal dialysis and investing

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in home dialysis. Economic evaluation found that addressing staff capacity and implementing quality improvement successfully would increase quality-adjusted life-years by 0.22 and 0.08, with cost increases of £8921 and £4547 per patient, respectively.

Limitations and future work: The Location of Dialysis Care in Kidney Life intervention is based on observational evidence and requires evaluating in real clinical settings.

Conclusions: The substantial variation centre use of home dialysis is linked to organisational culture, leadership and resource limitations to innovate practice. The Location of Dialysis Care in Kidney Life intervention proposes a scaffold for embedding leadership roles that support the development of a culture that empowers patients and staff. Redirection of resources to support staff is justified.

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A plain language summary of this synopsis is available on the NIHR Journals Library website https://doi.org/10.3310/MZSO4004.

Introduction

Background and rationale for research

People who get kidney failure have a number of possible treatment options available to them, including dialysis, transplantation and conservative care (a treatment approach that focuses on symptom control with medications and diet rather than prolongation of life, but distinct from end-of life care).[1,2] For some, dialysis and transplantation are typically used in a complementary manner over a lifetime with kidney failure, whereas others (> 60%) are unable to have a kidney transplant, usually for medical reasons. Undoubtedly, of these options, dialysis is the most challenging. It requires a considerable commitment of time and yet it only provides around 5–10% equivalent of kidney function. Overall, dialysis prolongs life (40% are alive at 5 years) and acts as a bridge to transplantation for those who are eligible. However, control of symptoms is suboptimal,[3] and we know that patients rank fatigue[4] and lack of life participation[5] among the worst limitations of the treatment.

Dialysis can be done in different settings. Most commonly, patients attend an outpatient haemodialysis (HD) unit [centre haemodialysis (centre-HD)], typically 3 days a week (either within the main hospital or in an associated satellite facility), but a significant proportion elect to have their dialysis in the home (home dialysis). This can be done using peritoneal dialysis (PD), either using manual treatments three to four times a day [continuous ambulatory peritoneal dialysis (CAPD)] or using an automated device overnight [automated peritoneal dialysis (APD)]. Alternatively, it can be done using HD at home, that is home haemodialysis (h-HD). A comparison of how these treatment options might be presented to patients can be found in the Dialysis Decision Aid (2024), developed and updated by the Yorkshire Dialysis and Decision Aid research team[6] and Kidney Research UK (KRUK): https://kidneyresearchuk.org/wp-content/uploads/2023/03/KR-decision-Aid-2024-P5-Final-artwork.pdf. Patients report choosing home dialysis for a number of reasons, but most report that having greater autonomy (e.g. flexibility for working, visiting family, travelling and life participation) and that the avoidance of travelling to and attending a dialysis unit 3 days a week are important.[7,8]

In addition to these direct advantages to a proportion of people with kidney failure, there are also potential societal benefits associated with greater use of home dialysis. Overall, dialysis is expensive, with the 30,000 people treated in the UK in 2023, costing the NHS > £1 billion.[9] Several studies have found that home dialysis is less expensive and is associated with health benefits, thus making it more cost-effective, though more comprehensive evaluations are needed.[10–14] The most recent National Institute for Health and Care Excellence (NICE) evaluation (*Guideline NG107*) was not conclusive in this respect, arguing that not all of the analyses are directly applicable to the NHS and recommending that further studies be done.[15] Equally, the true societal value of home dialysis is likely to extend beyond the conventional measures of cost-effectiveness,[16,17] that is quality-adjusted life-years (QALYs) and costs, to include societal productivity, as well as the previously mentioned benefits for life participation and family members.[7,8] There are also potential benefits to climate change, given that transport to hospital constitutes a significant proportion of the CO_2 emissions associated with centre-HD.[18,19]

Despite these apparent benefits and previous recommendations by NICE,[20,21] the use of home dialysis in England has remained stubbornly low.[22] Importantly, the proportion of kidney failure patients actually using home dialysis (PD and h-HD) varies considerably between centres in England (*Figure 1*) despite the fact that clinical outcomes are similar or even better in the short term for PD[23–25] and in the long term for h-HD[26–28] when compared to centre-HD. This suggests that there is a degree of inequity in access to home dialysis, and research shows

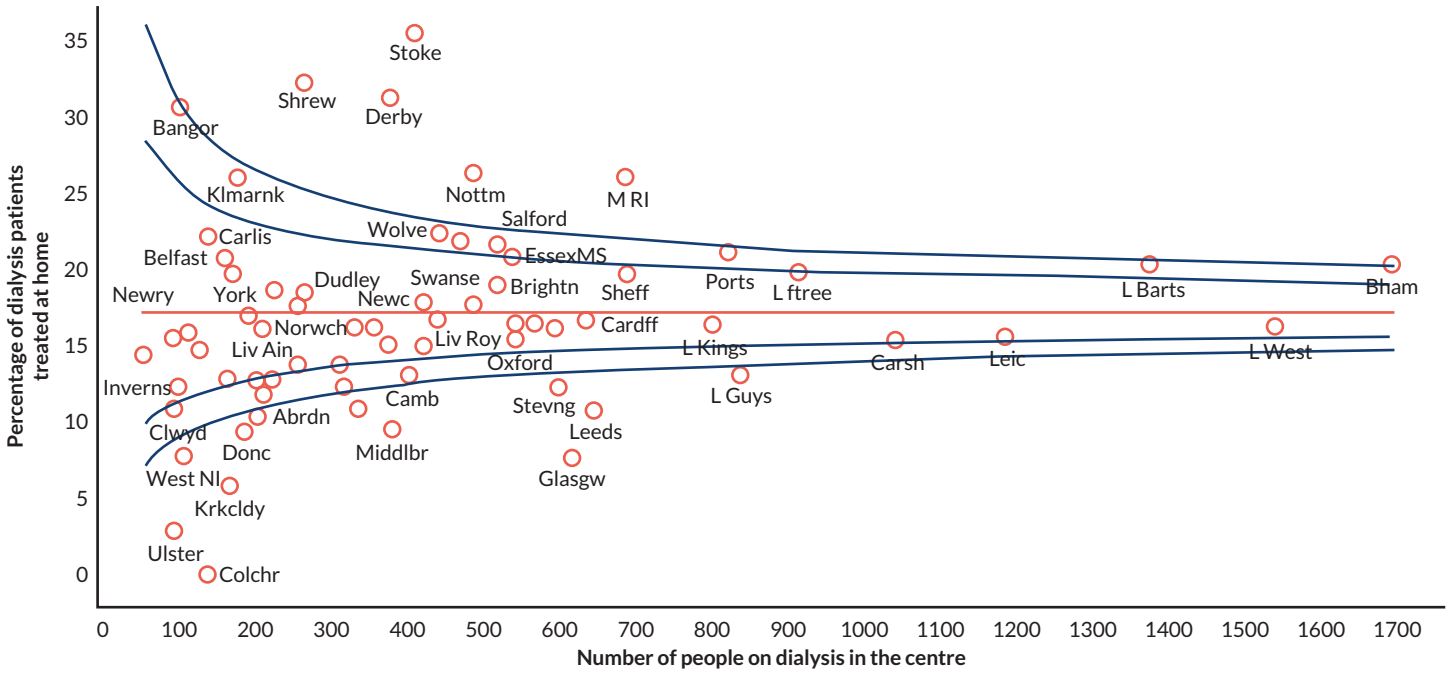

FIGURE 1 Proportion of dialysis patients using home dialysis in 2021 [UK Renal Registry (UKRR)] in UK dialysis centres – plotted against the centre size.

this is more evident in people from ethnic minorities or from less advantaged socioeconomic circumstances.[22] There is also centre variation in the availability of assisted PD (a-PD) despite there being a specific tariff for this submodality designed to cover the additional costs incurred by the dialysis unit and its inclusion in the NHS England service specification.[29,30] a-PD enables older, frailer or multimorbid patients to access home dialysis by providing them with assistance from a health support worker to do their dialysis.

Previous investigation of this apparent unwarranted variation in the use of home dialysis has indicated a number of centre characteristics and practices that are associated with the greater chances of patients being offered and getting home therapies; they include physician enthusiasm for these modalities, use of video-based training materials, home visits by the home dialysis team prior to choosing home dialysis, availability of the PD team for consultation out of hours and the ease with which the team can organise insertions of a PD catheter.[31,32] There is also evidence that policy interventions can have an impact on home dialysis use. When applied to seven centres in the Midlands, a dialysis commissioner's target that was linked to financial penalties combined with additional funding for staff and equipment, visible clinical champions and well-developed systems for patient training and ongoing support was associated with an increased uptake when compared to the rest of England.[33] Conversely, the barriers to uptake included lack of training of non-specialist staff, poorly developed education and unrecognised emotional and psychological needs of patients. These findings imply that there is a complex mixture of centre-level factors that are important determinants of home dialysis use, including both service organisation and institutional culture that require deeper examination if the existing large variation in home dialysis is to be addressed.

It is also clear that this state of affairs is of understandable concern to patients. The National Kidney Federation (NKF) has articulated this most strongly, running a *Home Dialysis Campaign*, initially, publishing a report in the form of a manifesto in 2013, informed by a home dialysis summit hosted by the All-party Parliamentary Kidney Group.[34] This was followed by a series of annual progress reports since 2021, documenting the high mortality rates of in-centre dialysis in relation to the COVID-19 pandemic, articulating seven interventions on how the NHS could increase home dialysis use.[35] First among these is a proposal for a target percentage of patients being on home dialysis at each of the UK dialysis units, with the expectation that 20% of prevalent dialysis patients would be at home by the end of 2024. This was in part based upon the findings and report of the *Getting It Right First Time* (GIRFT) initiative, specifically recommendation six, 'Ensure home therapy is promoted and offered for all suitable dialysis patients and that a minimum prevalent rate of 20% is achieved in every renal centre'.[36] This was followed by initiation of the Renal Services Transformation Programme (RSTP), which has endorsed this approach and overseen the setting up

of Clinical Networks with the responsibility of delivering these recommendations.[37]

Many of these developments have occurred since the proposal to undertake the *Intervening to eliminate the centre-effect variation in home dialysis use* (Inter-CEPt) study, which commenced in January 2021 (being delayed by the COVID pandemic). Nevertheless, they only emphasise the need for the research, reinforcing the rationale for Inter-CEPt, which is focused on understanding and providing evidence-based solutions to the unacceptable degree of centre-level variation in home dialysis use.

Objectives

Overall objective

To create an evidence based, user-centred intervention designed to enable dialysis centres to optimise their use of home dialysis, thereby eliminating the existing centre-level variation in its use.

Overall study design

We employed an integrated research design (*Figure 2* and published protocol[38]): underpinned by the framework for 'Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies' (NASSS),[39,40] Inter-CEPt used an exploratory, sequential mixed-methods approach. Qualitative insights were derived from a multisite-focused team ethnography, conducted at four case study sites [work package 1 (WP1)] which were used both to inform design of the intervention directly as well as the development of a quantitative survey of home dialysis services in all 51 dialysis centres in England [work package 2a (WP2a)]. Findings from the survey were then linked to patient-level data from the UKRR and the construction of a dependency graph, allowing the complex inter-relations among patient and centre-level factors leading to uptake of home dialysis to be examined [work package 2b (WP2b)]. A multistate model describing how home dialysis is used over a lifetime of kidney failure in the context of other treatment modalities (in-centre dialysis and transplantation) was developed [work package 2c (WP2c)], enabling us to estimate the time spent on each modality and the probability of transitioning between them. This allowed us to estimate the effects of age, sex, ethnicity and socioeconomic status on these transitions, and a similar model informed the economic evaluation [work package 3 (WP3)] in which the cost-effectiveness of initiating patients at home versus centre-HD was determined. We then undertook a synthesis of the qualitative and quantitative data [work package 4 (WP4)] to develop a detailed picture of the factors associated with uptake of home dialysis and identify candidate components of an intervention that would most likely yield the greatest benefit, using the economic evaluation to establish their cost-effectiveness, assuming they were able to eliminate barriers and/or optimise home dialysis use. These findings were then used to inform the coproduction with key stakeholders of a service delivery intervention [work package 5 (WP5)]. This was achieved using the capability (C), opportunity (O) and motivation (M) (COM-B) framework[41] for behaviour change interventions through workshops with patients and healthcare professionals to ensure acceptability and feasibility, which were then tested using the economic evaluation (WP3) for their potential cost-effectiveness.

Summary of objectives, methods, data collection and analysis by work package

Work package 1: ethnography

Objective

To gain in-depth insights into the cultural and organisational factors that promote the uptake of home dialysis.

Expected outcome

An understanding of the behaviours and service organisation in dialysis centres with above average uptake of home dialysis, especially those that serve populations with high proportions of ethnic minorities or socioeconomic challenges.

Methodology

Ethnographic study of patients, carers, staff and processes in four case study sites selected using a positive deviance approach for their above average or high performance, patient population characteristics, geographical spread and an even split of being transplant versus non-transplant centres. Non-participant observations to include multidisciplinary team meetings, education materials and patient pathway organisation. For participant observations, maximal sample sizes from each site: short reflection interviews ('think aloud'), 6–8 encounters per site with staff, patients and carers; semistructured interviews, with patient and carers (10/site), staff (12/site). Data synthesis and analysis included field notes and interview transcriptions, frequent team meetings and discussions with the patient advisory group (PAG) and mapping of themes to the NASSS framework.

Work package 2: quantitative analyses

Objective

To understand and quantify the interplay of patient- and centre-level factors, including geography and satellite

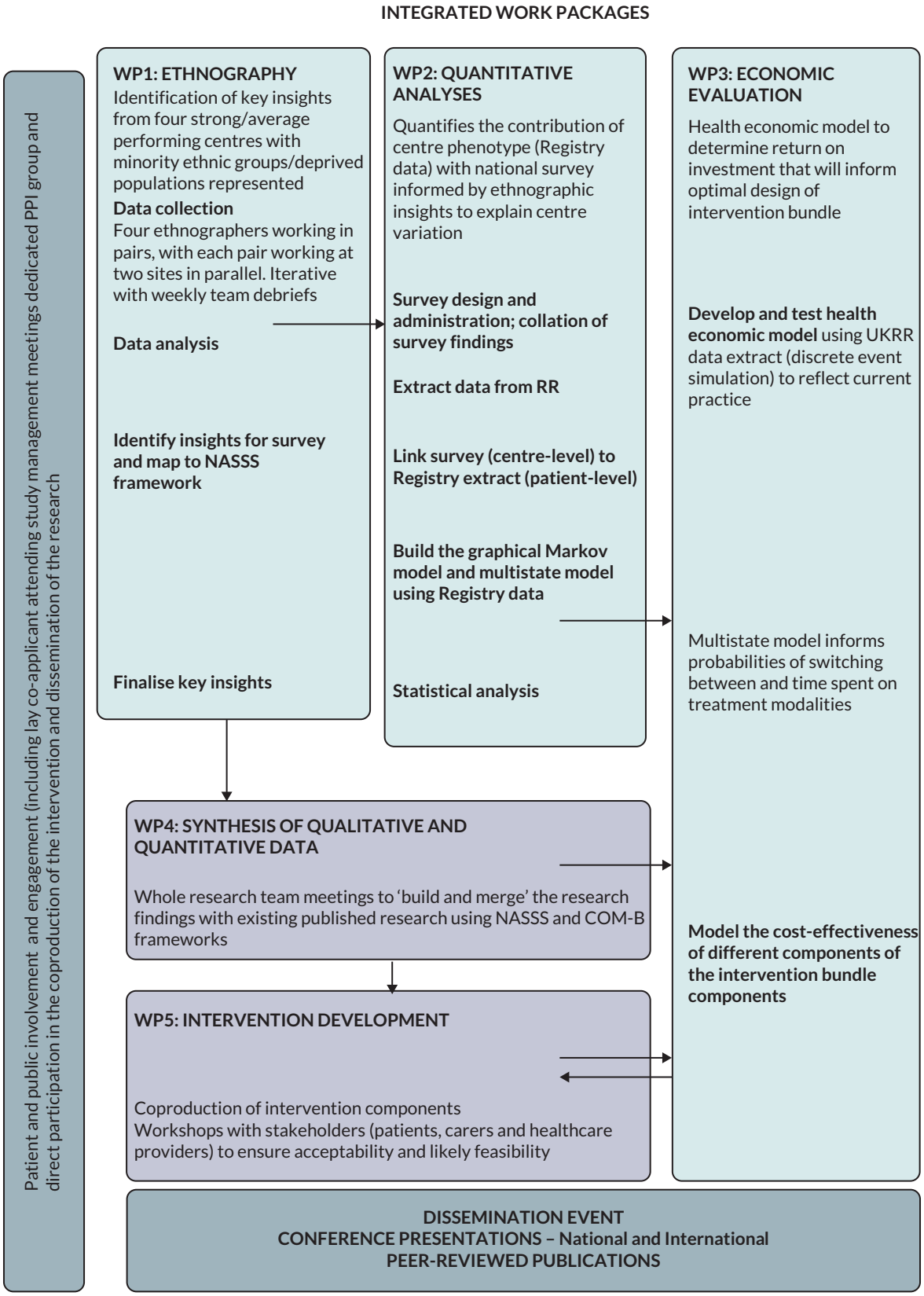

FIGURE 2 Study flow chart. PPI, patient and public involvement; RR, Renal Registry.

facilities affecting home dialysis uptake, taking into consideration transplantation as a competing treatment and other patient outcomes such as death.

Expected outcome

A complete picture of home dialysis service provision in England that establishes how centre-level characteristics impact on home dialysis update, taking patient factors into account, and how patients move through different treatments according to their demographic characteristics.

Methodologies

WP2a: National survey of home dialysis. A detailed environmental scan of home dialysis services completed by all the dialysis units in England. Survey questions covered all aspects of the service with questions informed by the results of the ethnography and the existing published literature. Answers to the survey were analysed descriptively and correlated with the rate of home dialysis uptake in each centre calculated from the UKRR.

WP2b: Sequences of regression analyses (graphical Markov modelling) integrating patient-level outcomes (UKRR) with responses to the England-wide survey. The patient-level outcome of interest was being on home dialysis within 12 months of starting kidney replacement (chosen because it usually takes a few months to establish a patient on h-HD and some patients present as an emergency for which the default treatment is centre-HD).

WP2c: Multistate model of kidney failure treatment modality transitions (home dialysis, centre dialysis, transplantation and death), incorporating ethnicity, age, sex and socioeconomic status. Data source: data extracted from the UKRR.

Work package 3: economic evaluation

Objective

To use economic evaluation to compare the cost-effectiveness of initiating dialysis at home compared to in-centre and so establish the potential return on investment for implementing the proposed intervention (WP5).

Expected outcome

A new health economic model of dialysis modalities applicable to England, which estimates the cost-effectiveness of home compared to in-centre dialysis, while addressing the previous modelling limitations highlighted by NICE and also estimating the potential maximum economic benefits of implementing or not implementing the intervention.

Methodology

A cost–utility analysis of home dialysis using an individual-based microsimulation model to estimate the lifetime QALYs and NHS costs incurred (including previously unmodelled costs), aiming to evaluate the incremental net monetary benefit (INMB) of starting treatment with home versus in-centre dialysis. INMB quantifies the added value of home dialysis by converting the difference in health gains (QALYs) and costs between and home and in-centre dialysis into monetary terms, allowing a clear comparison of the potential economic advantage of home dialysis over in-centre dialysis. The transition probabilities and durations associated with treatment modalities were based on the multistate model (WP2b). The potential impact of a successful implementation of the intervention on stresses on staffing within dialysis centres and implementation of quality improvement was modelled.

Work package 4: synthesis

Objective

To use the findings from the previous WPs to identify factors most likely to be modifiable, effective and easily adopted.

Expected outcome

A detailed synthesis of factors that explain centre variation in home therapies uptake that are potential candidates for inclusion in WP5.

Methodology

To use established methods of data synthesis (building and merging) employing several frameworks, including COM-B and NASSS. At meetings of the whole research team, the findings were mapped initially to the NASSS framework to identify modifiable factors. These were then mapped to the COM-B framework for behaviour change and were combined with a rapid literature review to establish how existing interventions might be incorporated.

Work package 5: design of the Location of Dialysis Care in Kidney Life intervention

To be implemented at the centre or network level to support dialysis providers in offering dialysis options equitably, increasing people's engagement with the choices and optimising the use of home dialysis.

Expected outcome

A co-designed intervention that is acceptable, feasible and, if successfully implemented, has the potential for a return on investment.

Methodology

Informed by the Medical Research Council (MRC) framework for developing complex interventions and the identification of modifiable factors and the behaviours in WP4 (incorporating existing evidence-based intervention from the literature), we undertook co-design workshops with multiple stakeholders (patients, carers, doctors, nurses and industry). Initial drafting of the intervention used the Making Informed Decisions Individually and Together (MIND-IT) in healthcare conceptual framework[42] to create a logic model for the intervention presented, along with our economic evaluation, to the second co-design workshop. Further insights from this workshop were used to refine the intervention.

Results summary by work package

Work package 1: ethnography

Characteristics of the selected sites

Of the 4 sites selected (from the 51 in England), the proportion of patients on home dialysis as a percentage of *all* kidney replacement treatments (i.e. both dialysis and transplantation) ranged between 9% and 23% (national mean: 7.6%), with between 15% and 31% of patients on home dialysis from ethnic minorities (all above median or in the top 10% nationally). Two were transplant centres, and there was a wide geographical spread (Portsmouth, London, Derby and Salford).

Observations

During 2021–2, in total there were 34 observations of consultations, team meetings, patient education and training sessions and 72 interviews with staff, patients and carers. Initially, due to COVID pandemic restrictions, the ethnographers could not gain access to hospitals, conducting the research online (as were many meetings and consultations) during 2021.

Findings

Following mapping to the NASSS framework, three themes were identified that would support patients in deciding to pursue home dialysis as their treatment option:

1. *Encouraging patient voice and individualised support*. It was observed that staff in these centres appreciated the scale of emotional and practical upheaval faced by patients as they approach the need for dialysis, and this was reflected in their encouragement of patients to raise issues important to them in their daily lives. This extended to socioeconomic inequalities and the attempts by the multidisciplinary team to address barriers such as poor housing, housing, self-efficacy and stigma of illness. Peer support and engagement with national and local charities were encouraged.
2. *Ensuring choice and access to home dialysis.* The philosophy of the centres was to help patients choose the treatment that is right for them and to plan care accordingly. Transparency about the treatment options was paramount rather than making assumptions other than a presumption of eligibility for home dialysis if this is what the patient wished to pursue, as opposed to raising barriers.
3. *Achieving sustained change based on benefits for patients.* All the centres exhibited a strong service improvement culture and an openness to working with wider stakeholders.

The features in common were those of an organisation culture that supported patient and carers to think proactively about different options in the context of their lives, enabled their kidney care teams to talk through different management plans to meet clinical and social needs, and empower them to have confidence if choosing home dialysis. This culture was characterised by openness to quality improvement, change and a shared belief in the benefits of home dialysis. Notably, centres had different infrastructures and approaches to organising their services that support this choice culture.

Work package 2a: national survey of home dialysis

Survey development and design

The design was informed by: (1) the existing literature [including previous analyses of home dialysis in the UK, documented barriers to home dialysis (e.g. lack of leadership and poor access to peritoneal catheter insertion services)] and reports of interventions that may improve access to home dialysis (e.g. use of a-PD and peer group support); (2) the findings of the ethnography (e.g. inclusion of questions probing organisational culture) and (3) suggestions and feedback from the PAG (e.g. engagement with local charities and patient support services). Survey questions required dichotomous answers, selection of one or more options from a list or five-point Likert scale responses assessing the respondent agreement with statements about specific aspects of service organisation/delivery. The approach to analysing multiple answers to questions was prespecified.

Survey administration and response

Dissemination was via the Joint Information Systems Committee (JISC, jisc.ac.uk) Online Survey Tool and it

included 78 questions across 12 domains. It was targeted at all staff involved in providing home dialysis services and as many staff per centre who wished to respond could, for which they could obtain a voucher (value £25). Some of the questions were targeted towards specific members of the team, and not all staff were expected to complete all questions within the survey. Administered between June and September 2022, 180 responses were received from 50 of the 51 English dialysis centres. Of these, dialysis nurses responded in the greatest numbers (*n* = 58; 32.2%), followed by Advanced Kidney Care clinic staff who are typically responsible of initiating dialysis discussions (*n* = 41; 22.8%), clinical leads (*n* = 37; 20.6%), physicians (*n* = 35; 19.4%) and centre managers (*n* = 9; 5.0%). There were between 1 and 10 responses from each centre (median 3, mean 3.5), and one to seven staff roles were represented at each centre (mean 3.2). The proportion of survey questions with at least one response from each centre ranged from 22.4% to 100% (mean 72.3%).

Survey findings

All centres offered both home treatment modalities apart from one centre not offering h-HD. Forty-two of 50 centres offered a-PD, usually for the frail elderly patients, of which 25 were using commercial partners to deliver this service. Centres offering a-PD had a higher rate of uptake of home dialysis, 25.6% versus 15.6%. All centres provided written materials for patients choosing their dialysis modality, whereas other aspects of patient education and support were variable [e.g. peer educators, 44%; external (commercial) educators 33%; peer support 20%; resources for visually impaired, 45.5%; different reading ages, 33%; video/ digital versatile discs, 17.4%; multiple languages, 8.3%]. None of these were correlated with uptake of home dialysis. Likewise, there were no correlations with any aspect of dialysis training or dialysis access provision or method of use (PD catheters and use of buttonholing).

Overall, the findings of the survey corroborated those of the ethnography with centre-level characteristics associated with higher uptake of home dialysis being those of organisational culture (*Table 1*: leadership, opportunities and encouragement to reflect on service improvement and new initiatives or engage with research), rather than specific aspects of service organisation. It was also clear that a lack of resources as perceived by those filling out the survey were associated with lower uptake of home dialysis. Many aspects of service provision that would be considered to be 'best practice' were so widespread in their adoption that they did not discriminate between centres, including the following: use of clinical props in training, engagement with charities and local patient associations, opportunity to interact with other home dialysis patients, advice for working age patients, advice on council tax reduction and independence payments, support with utility bills and priority services registration.

Work package 2b

Dependency graph displaying centre-level and clinical- and demographic patient-level factors directly and indirectly associated with home dialysis uptake within 12 months of starting kidney replacement therapy (KRT) (graphical Markov model).

The methodology underpinning this analysis is described in detail in the WP2b publication (see *Box 1*). Briefly, we developed a graph (*Figure 3*) to visualise direct and indirect associations between the patient- and centre-level factors with Home Therapy uptake within 1 year of starting KRT (largely informed by the literature and our own observations from WP1 and WP2a). Ordered sequences of regressions,[44,45] which are an extension of path analysis,

TABLE 1 Summary of significant associations with the centre rate of home dialysis uptake (as reported to the UKRR) found in the national survey

The centre characteristics that did correlate with home dialysis uptake were
Clinical leads seeing home dialysis as important, *R* = 0.32 (95% CI 0.05 to 0.55)
Opportunities for staff to reflect on practice, *R* = 0.38 (95% CI 0.11 to 0.60)
Staff encouraged to try new initiatives, *R* = 0.57 (95% CI 0.34 to 0.73)
Staff have opportunities to contribute to research, *R* = 0.39 (95% CI 0.13 to 0.61)
Centre committed to quality improvement, *R* = 0.29 (95% CI 0.01 to 0.53)
Holding a view that home dialysis saves money, *R* = 0.38 (95% CI 0.11 to 0.59)
The centre characteristics that correlated with less home dialysis uptake were
Perceived financial stresses on centre budget, *R* = −0.33 (95% CI −0.56 to −0.06)
Perceived stresses on staff capacity, *R* = −0.38 (95% CI −0.60 to −0.11)

CI, confidence interval; *R*, univariate Pearson correlation coefficients.

Source

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BOX 1 Summary of publications synthesised in this synopsis by work package

WP	Publication
WP1	Allen K, Shaw K, Spry J, Dikomitis L, Coyle D, Damery S, *et al*. How does organisational culture facilitate uptake of home dialysis? An ethnographic study of kidney centres in England. *BMJ Open* 2024;**14**:e085754. https://doi.org/10.1136/bmjopen-2024-085754
WP2a	Damery S, Lambie M, Williams I, Coyle D, Fotheringham J, Solis-Trapala I, *et al*. Centre variation in home dialysis uptake: a survey of kidney centre practice in relation to home dialysis organisation and delivery in England. *Perit Dial Int* 2024;**44**:265–74. https://doi.org/10.1177/08968608241232200
WP2b	Potts J, Pearse CM, Lambie M, Fotheringham J, Hill H, Coyle D, *et al*. Patient and center factors in home dialysis therapy uptake: analysis of a UK Renal Registry cohort and a National Dialysis Center survey. *Am J Kidney Dis* 2026;**87**:53–64.e1. https://doi.org/10.1053/j.ajkd.2025.08.012
WP2c	Potts J, Pearse CM, Lambie M, Fotheringham J, Hill H, Coyle D, *et al*. Health disparities in transitions between kidney replacement therapy modalities and mortality in England: A multistate model using UK Renal Registry data. *PLOS Med* 2026;**23**:e1004674. https://doi.org/10.1371/journal.pmed.1004674
WP3	Hill H, Fotheringham J, Potts J, Solis-Trapala I, Lambie M, Damery S, *et al*. The cost-effectiveness of initiating patients on home dialysis compared with in-centre haemodialysis. *Appl Health Econ Health Policy* 2025;1–11. https://doi.org/10.1007/s40258-025-00976-7
WP4 and WP5	Weight L, Wiliams I, Bekker H, Coyle D, Fotheringham J, Hill H, *et al*. Development of 'LOCAL', a service delivery intervention to eliminate the centre-effect variation (Inter-CEPt) and optimise home dialysis use. *Pure* 2024 (under review). https://doi.org/10.25500/pure.bham.270963859

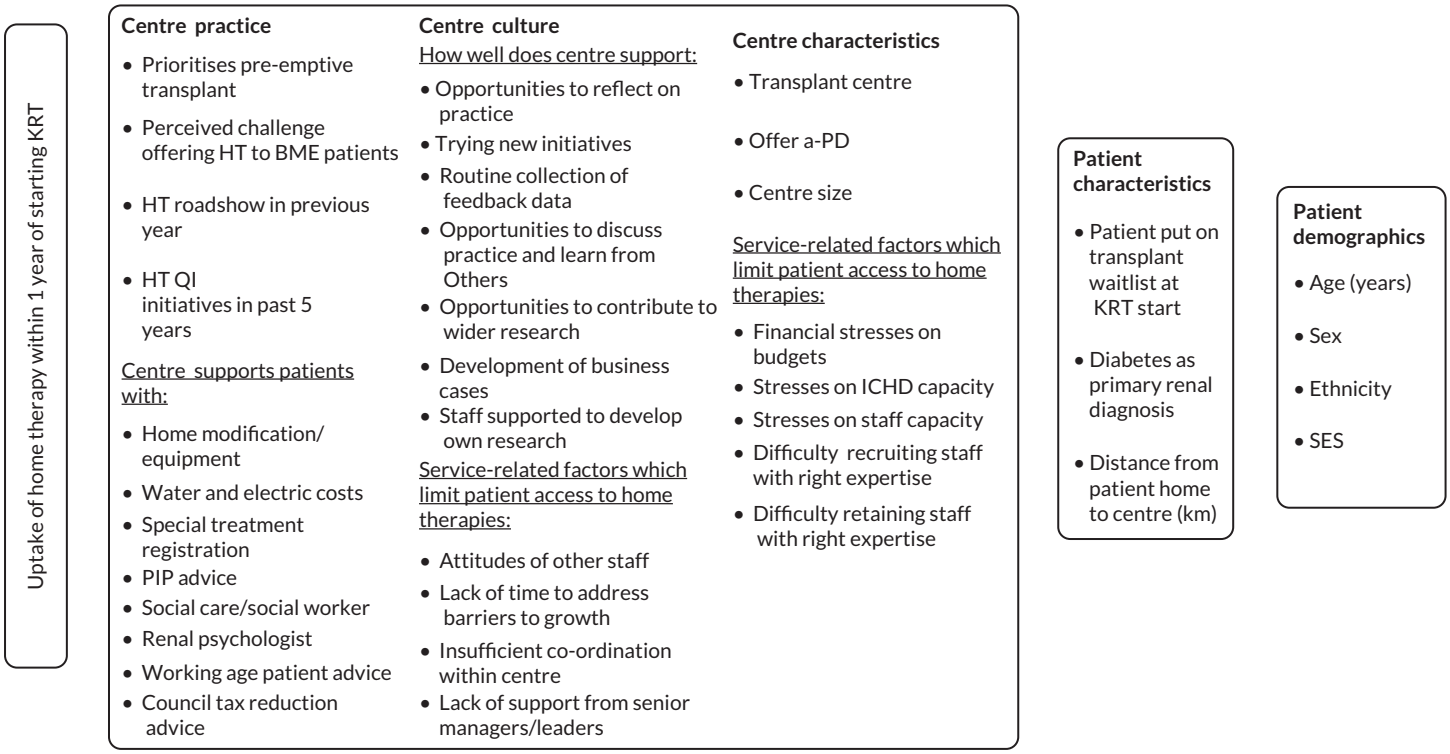

FIGURE 3 Initial ordering of factors depicting the proposed hierarchical associations, as read from right to left so that the factors located inside the boxes on the right-hand side are explanatory to those within the left-hand side boxes. SES, socioeconomic status; QI, quality improvement. Reproduced with permission from Potts *et al.*[46] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

were fitted to estimate the associations. *Figure 3* displays the a priori hypothesised direction of associations, reflecting home dialysis uptake as the primary outcome and centre-level factors acting as intermediaries in the relationship between patient-level factors and uptake. A model of best fit was obtained for home dialysis uptake using a mixed-effects logistic regression model in which the dependent variable (home dialysis) was coded '0', and the alternative, in-centre haemodialysis (ICHD), '1', initially controlling for the factors shown in *Figure 3*, including a random intercept to account for the correlation between any pair of responses from patients within the same centre. Similar models were developed for the centre-level factors, with patient characteristics as explanatory factors. This analysis linked data from the national survey (WP2a) with patient-level data obtained from the UKRR between 2015 and 2019 as follows: we selected an initial set of survey questions, aggregated by centre using pre-defined rules, and included those for which > 50% of centres had responded (> 90% completeness). The final list was agreed at a team meeting, which also considered the plausibility of a clinically important association with home dialysis. Survey responses were then linked to the UKRR data, including demographics (age, sex, ethnicity and neighbourhood deprivation) and clinical characteristics (diabetes as primary renal diagnosis, transplant waitlist status and distance to nearest renal centre) at KRT initiation and treatment timelines. The best-fitting regression model for each outcome in the sequence of regression analyses was selected by comparing nested models with different combinations of explanatory factors using likelihood ratio test. Details of the construction and evaluation of the logistic regression, including model-building steps (e.g. variable selection approach and handling of multicollinearity), tests for non-linear effects, assumption checks and goodness-of-fit measures, are comprehensively reported in the main publication.

Findings

About 32,400 individual patients from 51 dialysis centres in England were included in the analysis. *Table 2* shows the factors that were directly associated with the odds of being

TABLE 2 Direct associations of centre- and patient-level factors with the odds of a patient being on home dialysis within 12 of commencing kidney replacement treatment, odds ratio (95% CIs)

Factor level	Descriptor	Odds ratio (95% CI)
Patient demographic	Age (years)	0.91 (0.90 to 0.92)
	Ethnicity	
	White (reference)	–
	Asian	0.84 (0.77 to 0.92)
	Black	0.84 (0.75 to 0.95)
	Mixed	0.77 (0.62 to 0.96)
	Other	0.93 (0.75 to 1.16)
	IMD deprivation level quintile	
	(Least) 1	1.34 (1.21 to 1.48)
	2	1.17 (1.06 to 1.28)
	3 (reference)	–
	4	0.86 (0.79 to 0.95)
	(Most) 5	0.74 (0.68 to 0.81)
Patient characteristics	On the transplant waiting list at start	2.55 (2.35 to 2.77)
	Diabetes as primary diagnosis	0.93 (0.88 to 0.99)
Centre characteristics	Centre offers a-PD	1.89 (1.39 to 2.57)
	Stresses on staff capacity	0.60 (0.45 to 0.81)
Centre culture	Opportunities to contribute to research	1.35 (1.03 to 1.77)
	Lack of support limits HT access	1.47 (1.13 to 1.92)

TABLE 2 Direct associations of centre- and patient-level factors with the odds of a patient being on home dialysis within 12 of commencing kidney replacement treatment, odds ratio (95% CIs) (*continued*)

Factor level	Descriptor	Odds ratio (95% CI)
Centre practices	Home dialysis-related quality improvement initiative in the last 5 years	1.94 (1.36 to 2.76)
	Home therapies roadshow in the last year	1.22 (1.05 to 1.41)

CI, confidence interval; IMD, Index of Multiple Deprivation.

Source
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treated with home dialysis within 12 months of initiating KRT. The strength of the associations was measured using odds ratios with 95% confidence intervals (CIs).

Work package 2c: multistate model of kidney failure treatment modality transitions

We fitted a continuous-time multistate model with five states (*Figure 4a*) to estimate hazard rates of transition between modalities and to death, in terms of patient demographics. Patients could transition between any of the treatment states, potentially multiple times, but transition between home dialysis modalities and transplant to h-HD were excluded because they were very infrequent (< 1% of possible transitions). The data included the treatment history of 93,451 patients commencing kidney replacement treatment between 2005 and 2020, with a median follow-up of 1497 days [interquartile range (IQR) 640–2841], 6% participants lost to follow-up and 1759 recovering kidney function (< 1%). Again, details of the model construction and evaluation are reported in the full manuscript, *Box 1*. Additionally, we fitted a continuous time multistate model with four states (home dialysis, centre dialysis, transplantation and death), *Figure 4b*, specifically developed for use in the economic evaluation (see WP3). This model focused on accurately estimating transition probabilities and time spent in each treatment modality state; therefore, it used different assumptions to that developed for the detailed treatment modality transitions. This model underpinned the microsimulation conducted in WP3 to examine how individual-level differences influenced health economic outcomes.

Findings

The median number of transitions per patient was 2 (IQR 1–2, maximum 49). Over the period of study, the proportions starting on each modality was stable: 71–76% on centre-HD, 3–8% with a transplant, 20–23% on PD and < 1% on h-HD. The age distribution, mean 64–65 years and levels of neighbourhood deprivation were stable, but with over-representation in groups with higher deprivation levels: Group 1 (least deprived): 15%, 2 : 18%, 3 : 19%, 4 : 22%, 5 25%. There was a modest increase over the 15 years in the proportion of patients commencing KRT who identified as Asian (10–14%) or Black (6–8%), with a concomitant fall in those who identified as White (73–68%).

Focusing on transitions to and from home dialysis (*Table 3*), there are marked differences in the hazard rates of switching modalities between ethnic groups. Under-represented ethnic groups have considerably lower rates of transition to home dialysis from centre-HD or transplant compared to White people, as are patients with higher levels of deprivation. Notably, women have a higher hazard rate of transition from transplant to PD than men but lower rates of transition from home dialysis to centre-HD or transplant. Switching from PD to either centre-HD or transplant shows a more mixed picture by ethnic group, with a reduced hazard rate seen in the Asian group and an increased rate in Black compared to White patients. Switching from PD to centre-HD is not associated with deprivation level, whereas it has a large impact on transplantation likely related to eligibility. Transitions from h-HD are difficult to interpret as the numbers are small and the Cis are relatively large.

Work package 3: economic evaluation

Defining the economic model

The model structure was simplified from that used in WP2c by combining the home dialysis modalities into a single health state, keeping centre-HD, transplantation and death as the absorbing state (*Figure 5*). This simplification was due to convergence failures in the multistate model from low numbers of transitions to and from the h-HD state in the UKRR. The individual-level health benefits, expressed as QALYs, were determined according to how long each simulated patient spent in each modality and

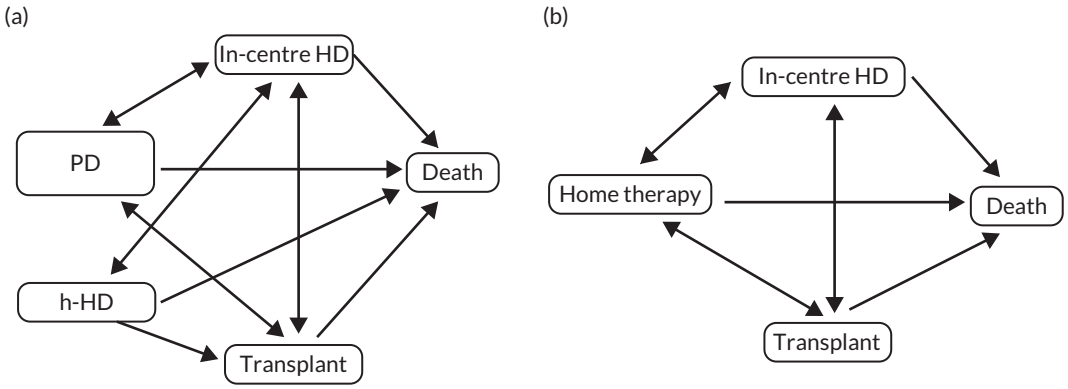

FIGURE 4 Multistate model representations of the transitions allowed between (a) five and (b) four states.

TABLE 3 Hazard ratios (95% CI) for transitions to and from home dialysis from centre-HD and transplant

Demographic characteristic	Centre-HD to PD	Centre-HD to h-HD	PD to centre-HD	Home HD to centre-HD	PD to transplant	Transplant to PD
Ethnicity						
Asian	0.67 (0.62 to 0.73)	0.29 (0.26 to 0.34)	0.87 (0.83 to 0.93)	0.82 (0.67 to 1.01)	0.91 (0.84 to 0.99)	0.79 (0.58 to 1.07)
Black	0.63 (0.58 to 0.70)	0.47 (0.41 to 0.53)	1.17 (1.09 to 1.25)	0.82 (0.67 to 1.01)	0.67 (0.60 to 0.76)	1.06 (0.74 to 1.53)
Mixed	0.74 (0.60 to 0.92)	0.55 (0.41 to 0.76)	1.10 (0.94 to 1.28)	0.77 (0.48 to 1.23)	0.86 (0.68 to 1.10)	0.44 (0.14 to 1.36)
Other	0.58 (0.47 to 0.72)	0.32 (0.22 to 0.46)	0.94 (0.81 to 1.10)	0.84 (0.50 to 1.42)	0.88 (0.70 to 1.10)	0.51 (0.19 to 1.38)
White	Reference	Reference	Reference	Reference	Reference	Reference
Deprivation quintile						
Least deprived area 1	Reference	Reference	Reference	Reference	Reference	Reference
2	0.90 (0.83 to 0.98)	0.94 (0.85 to 1.05)	1.03 (0.98 to 1.10)	1.02 (0.8 to 1.17)	0.87 (0.80 to 0.94)	0.96 (0.70 to 1.31)
3	0.80 (0.74 to 0.87)	0.70 (0.63 to 0.78)	0.99 (0.93 to 1.05)	0.81 (0.70 to 0.94)	0.77 (0.72 to 0.85)	1.17 (0.87 to 1.57)
4	0.71 (0.65 to 0.76)	0.60 (0.54 to 0.67)	1.04 (0.98 to 1.11)	0.87 (0.75 to 1.01)	0.71 (0.65 to 0.77)	0.77 (0.56 to 1.06)
Most deprived area 5	0.62 (0.58 to 0.67)	0.49 (0.44 to 0.54)	1.06 (0.99 to 1.12)	0.84 (0.73 to 0.98)	0.54 (0.50 to 0.59)	0.95 (0.70 to 1.29)
Sex						
Male	Reference	Reference	Reference	Reference	Reference	Reference
Female	0.96 (0.91 to 1.01)	0.90 (0.84 to 0.96)	0.86 (0.82 to 0.89)	1.05 (0.95 to 1.15)	0.90 (0.85 to 0.95)	1.45 (1.20 to 1.75)
Age (per year)	0.97 (0.97 to 0.97)	0.96 (0.96 to 0.96)	0.99 (0.99 to 0.99)	1.00 (1.00 to 1.01)	0.95 (0.95 to 0.95)	0.98 (0.98 to 0.99)

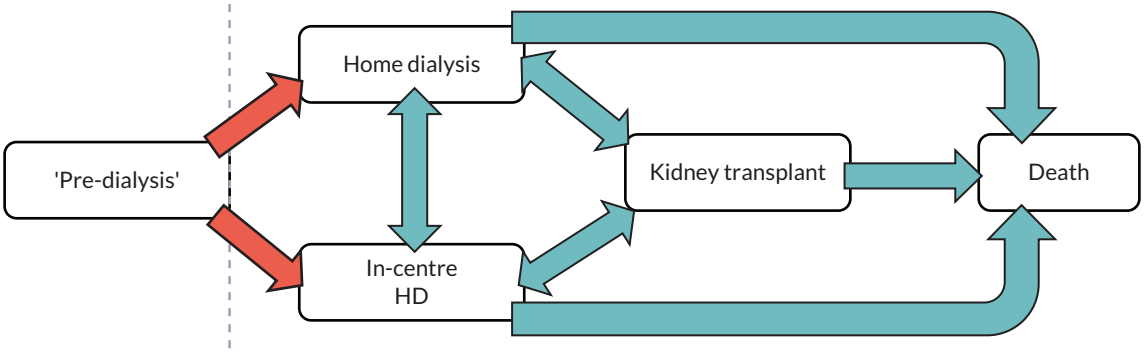

FIGURE 5 The economic evaluation model structure. Reproduced with permission from Hill *et al.*[50] This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) licence, which permits others to distribute, remix, adapt and build upon this work, for commercial use, provided the original work is properly cited. See: https://creativecommons.org/licenses/by/4.0/. The figure includes minor additions and formatting changes to the original text.

their demographic characteristics, age, sex and ethnicity, as collected by the UKRR and determined from WP2c. Age-adjusted EuroQol-5 Dimensions, three-level version (EQ-5D-3L) utility values were based on 523 ICHD patients across five UK sites, collected in 2020 and 2021,[47] using established mixture of modelling methods, with age as a covariate to estimate the distribution of EuroQol-5 Dimensions utility values. To establish health utility in home dialysis in comparison with ICHD, sex-specific estimates of EQ-5D-3L health utility differences between patients on ICHD and other modalities, including transplant, were applied from an existing UK study.[48] These estimates of utility were identified as high quality in a systematic review.[49] The healthcare costs, including dialysis, transplantation and hospitalisation costs, were derived from a number of sources, including a recent comprehensive micro-costing study in the UK (*Table 4*).

The model used in this study offers several advantages over previous health economic modelling discussed by NICE on dialysis cost-effectiveness. Key benefits include:

1. *Data scale and representativeness*: This model uses a large, nationally representative data set from the UKRR, incorporating data from over 32,000 patients. This ensures that the results are broadly applicable and avoids the limitations of earlier models based on smaller or non-representative samples.
2. *Dynamic patient pathways*: Unlike previous studies, which often assumed a single, fixed dialysis modality, this model allows for multiple switches between treatment modalities (e.g. from home dialysis to in-centre-HD or transplant), reflecting more realistic patient journeys over a lifetime. This flexibility improves the accuracy of predictions related to health outcomes and costs.
3. *Integration of patient- and centre-level variables*: The model considers individual patient characteristics (e.g. age, sex and comorbidities) and dialysis centre attributes, such as quality improvement initiatives and staffing capacity. This granularity helps capture factors influencing treatment pathways and outcomes, making the model more sensitive to variations across patient populations and healthcare settings.
4. *Cost precision*: The model's cost estimates are based on detailed micro-costing data, including specific NHS costs for different dialysis modalities (see *Table 4*). This enhances precision in estimating both the economic costs of different treatment pathways.
5. *Barrier analysis to adoption*: Unlike prior studies, this model evaluates the impact of eliminating specific barriers (e.g. staff capacity issues and lack of quality improvement initiatives) on home dialysis uptake. It does not include the costs of these interventions, as the purpose of the analysis is to demonstrate what the intervention could cost and still be cost neutral but health gaining. This unique approach allows for estimation of potential benefits from targeted interventions, guiding policy recommendations aimed at increasing Home Dialysis Treatment (HDT) adoption.

Running the model

Two thousand kidney failure patients commencing dialysis between 2015 and 2019 were randomly selected and their attributes (e.g. age and sex), obtained from the UKRR, were used to simulate their progression through the treatment modalities and associated quality of life. Deterministic and probabilistic sensitivity analysis was used to test uncertainty, including scenarios in which home dialysis was assumed to cost the same as centre-HD and where the transfer rate of home dialysis was the same as that for centre-HD. To determine the

TABLE 4 Micro-costing data, including specific NHS costs for different dialysis modalities

Cost component of treatments	Annual cost	Source and main costing assumptions
Routine dialysis costs		
CAPD	£17,721	Costs for UK routine dialysis[51] do not include inpatient hospital admissions and do not include medication use for commodities
APD	£22,355	See reference above
h-HD	£24,543	See reference above
ICHD	£37,759	See reference above
Dialysis inpatient and GP visit costs		
CAPD	£23,904	UK annual GP and inpatient hospital cost for patients with CKD 3 and 4[52] (£9194) multiplied by 3.6, which is the ratio of patients on HD to patients with CKD stage 3 and 4, which is 2.6[53]
APD	£23,904	As above[52,53]
h-HD	£33,098	UK annual GP and inpatient hospital cost for patients with CKD 3 and 4[52] (£9194) multiplied by patients on HD to patients with CKD stage 3 and 4 is 3.6[53]
Hospital haemodialysis	£33,098	As above[52,53]
Transplant costs		
Transplant cost in first year	£32,833	Cost includes all hospital related costs to transplant and excludes medication usage[54]
Transplant cost in subsequent years	£1532	Cost includes all hospital related costs to transplant and excludes medication usage[54]
Total annual cost of treatment		
Immuno-suppression drug costs	£6968	NHS Blood and Transplant[55]
PD	£44,414	Weighted average of the total annual cost incurred with CAPD (£41,626) and APD (£46,259). Weights are the prevalence rates of CAPD (39.8%) and APD (60.2%) among PD patients, taken from the 2022 UKRR annual report.[56] CAPD and APD total costs are established from the addition of routine dialysis costs[51] with GP and inpatient costs[52,53]
h-HD	£57,641	The addition of routine dialysis costs[56] with GP and inpatient costs[52,53]
HDT (either PD or h-HD)	£47,894	Weighted average of the total annual cost incurred with PD (£44,414) and h-HD (£57,641). Weights based on the prevalence rates of PD (73.7%) and HD (26.2%) among patients undergoing HDT, as reported in the 2022 UKRR annual report[56]
ICHD	£70,856	The addition of routine dialysis costs[53] with GP and inpatient costs[52,53]
Transplant in first year	£39,801	The addition of first year NHS hospital costs[54] and drug costs[56]
Transplant in subsequent years	£8499	The addition of NHS hospital costs after first year[54] and drug costs[56]

CKD, chronic kidney disease; GP, general practitioner.

Source

potential effect of a successful intervention on the two modifiable factors most associated with increasing the odds of patients receiving home dialysis as identified in WP2b, namely reducing the negative effects of stress on staffing and engaging in quality improvement, 500 simulations were run. By treating these as 'barriers' to home dialysis and assuming that dialysis itself is cost-effective and that home dialysis is more cost-effective than centre-HD, then scenarios with and without these barriers were compared.

Findings

Initiating a patient on home dialysis compared to centre-HD is cost-effective, resulting in 0.30 additional QALYs and a saving of £15,272. This remained favourable in the sensitivity analyses. Both removal of stresses on staffing and engaging in quality improvement initiatives were associated with benefits, leading to QALY gains of 0.08 and 0.22, but the cost increases of £5127 and £10,059 were incurred because of an increase in life-years lived of 0.22 and 0.54, respectively.

Work package 4: synthesis

Key components identified

These fell into two categories, relatively straight forward interventions that arose from the data, namely the provision of a-PD and the use of Home Therapies Road Shows (see *Glossary* for explanation), and complex interventions that would address issues of leadership, organisational culture, person-centred care, patient empowerment, engagement in innovation and quality improvement and their associated resourcing.

Using theoretical frameworks to consider what is required to modify these factors

At team meetings, the findings from WP1 to WP3 were mapped to the domains of the NASSS framework, which include (1) *Definitions*, (2) *Technology* (vs. home dialysis), (3) *Value Proposition*, (4) *Adopters*, (5) *Organisation*, (6) *Wider System* and (7) *Embedding* over time. For example, a clear line of evidence emerged from WP1 and WP2 that *organisational culture*, characterised by a commitment to a person-centred approach, is more important than the detail of service organisation. This can be mapped to a shared belief in the *value proposition* that 'for the right person Home Dialysis offers significant personal advantages' and that *adopters* will use specific skills and *organisational* processes to embed these values within the centre. This led to identification of the types of change an organisation would need to consider implementing. Expanding on this example, this would be the requirement to enhance the knowledge of the benefits of home dialysis to the whole professional team in a centre (not just those in the home dialysis team). It was also recognised that centre staff would have residual concerns about home dialysis and, thus when considering the institutional change needed and the type of intervention required (mapped to the COM-B framework), it would need not just education and training in specific skills (e.g. decision tools) but also in the art of persuasion.

Work package 5: design of the Location of Dialysis Care in Kidney Life intervention

Co-design workshop 1

A number of themes were identified, including the need for adequate resource and time to undertake quality improvement, the need for proper training in key skills (use of decision tools and unconscious bias), support from the local network with timely data, a greater role for commissioners of dialysis and the potential for financial incentives in driving change. Most important was the recognition of the need for strong leadership and the suggestion of a potential role for home dialysis champions and/or co-ordinators to drive organisational change.

Intervention drafting

The team took away these ideas and, using the MIND-IT framework, restructured the intervention (or set of interventions) into those designed to enhance centre culture and those more directly concerned with enhancing patient-centred practice. Tools to address the latter have largely been developed, and a rapid literature review was undertaken with a proposal that these would be embedded within the intervention (examples being shared care, decision aids, peer support and training in unconscious bias).

Co-design workshop 2

Following presentation of the draft intervention and economic evaluation, the focus of discussion was on how the intervention would be adapted at the local level. A preference for distributing the leadership roles was expressed with a recognition that some would be much more important for some centres than others (and at different times).

Finalising the Location of Dialysis Care in Kidney Life intervention

This was undertaken by the team and there were further meetings with the PAG, which were instrumental in naming and refining the intervention, *Location of Dialysis Care in Kidney Life* (LOCAL). *Figure 6* shows the final structure, and *Figure 7* provides examples of the proposed leadership roles along with their goals, types of activity and examples of the role content. A public-facing document describing the Inter-CEPt project and LOCAL intervention was developed with the PAG.

Discussion and interpretation

The principal findings of the Inter-CEPt study may be summarised as follows: in undertaking the first

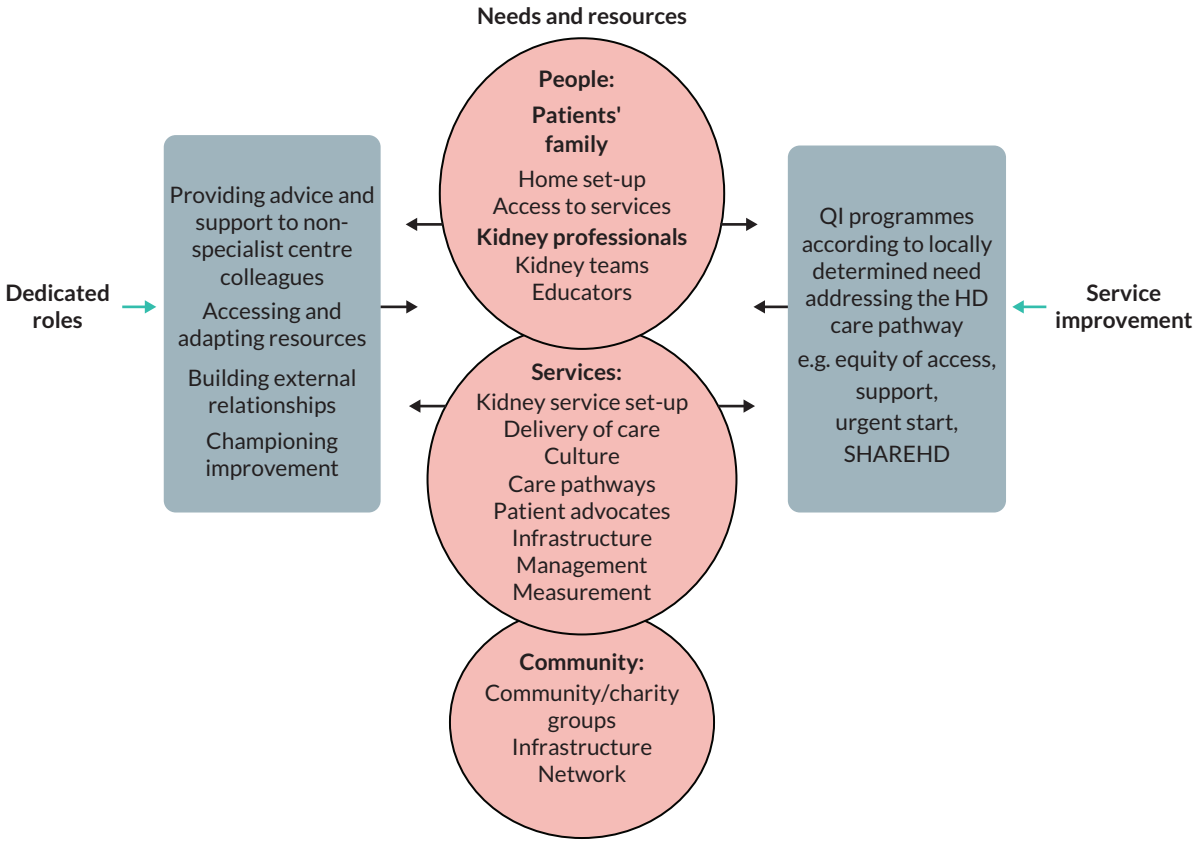

FIGURE 6 Overview of the LOCAL Service Delivery Intervention. QI, quality improvement.

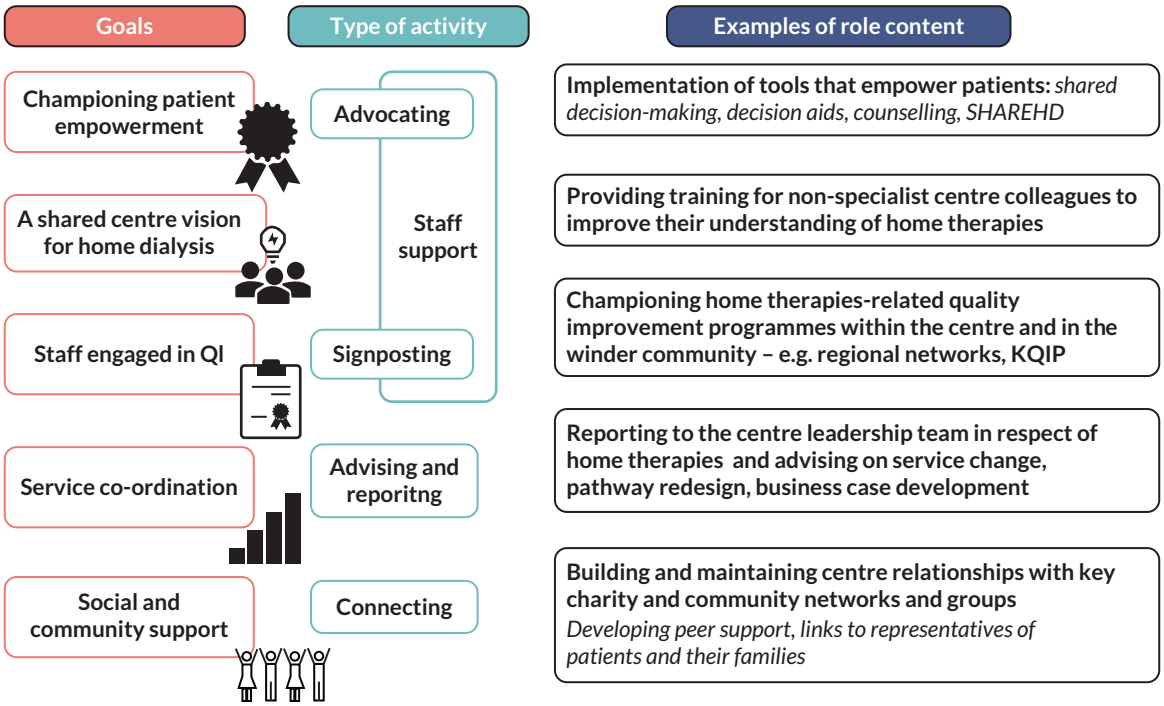

FIGURE 7 Examples of proposed leadership roles along with their goals, types of activity and content. KQIP, Kidney Quality Improvement Partnership.

ethnographic study of how centres support patients and their families to consider home dialysis (WP1), we found that an organisational culture characterised by belief in the benefits of dialysis choice combined with a presumption of eligibility was more important than how services were organised. This was largely confirmed in the findings of the national survey (WP2a), which highlighted several centre characteristics that associate with an increased use of home dialysis, with an emphasis on leadership, the provision of a-PD, a quality improvement and research culture and the importance of adequate resourcing. We were able to quantify these factors using the sequence of regressions analysis (WP2b) and thus demonstrate their relative impact on the uptake of home dialysis. We also undertook the first analysis of how patients transition through kidney failure treatment modalities over a lifetime of care, demonstrating that patient demography has a profound influence on this, with reduced access to home dialysis according to socioeconomic status and among ethnic minorities, not just at the start of their kidney failure treatment but throughout their life course. Our economic evaluation (WP3), designed to address the concerns previously raised by NICE in applying existing studies to the UK, found that starting on home dialysis is cost-effective and that supporting centres to undertake quality improvement and address the concerns of adequate staff resource would likely result in a return in investment. These results align with a recent (2023) UK modelling study,[13] which found that an integrated home dialysis model is cost-effective when compared with current renal replacement treatment pathways. The cost-effectiveness findings in both these models assume healthcare resources allocated to dialysis patients provide good value for the NHS despite the high costs associated with dialysis itself. To reflect this, neither model applies the baseline costs of dialysis to the life extension gained from home dialysis compared to in-centre dialysis. A key advantage of the Inter-CEPt model over the 2023 model[13] is its microsimulation design, which enables individual patient and centre characteristics to directly influence treatment pathways, giving more precise estimates of the economic impact of intervening in the patient pathway.

These findings provided both the big picture and the detail we required for the design of an intervention that centres might use to optimise their uptake of home dialysis (WP4). Work packages 1–3 provided a new evidence base for the co-design of an intervention (WP5), called 'LOCAL', which is characterised by an overarching attention to leadership, addressing the high-level organisational culture that encourages patients to consider the *location of their care*, supports them when they have personal barriers to considering this option and provides a high level of trust in the multidisciplinary team. As one patient said: 'choosing home dialysis is like an act of faith – I have to trust the team'. The intervention addresses leadership through the proposal for a number of roles that would focus on the key components of a favourable organisation culture, specifically incorporating patient empowerment, adopting a shared vision, quality improvement, attending to data and engagement with community networks, especially important for ethnic minorities. Involvement of patients in the development and delivery of these roles is strongly encouraged. LOCAL embraces specific interventions, as reported in the literature, designed to increase the offer of choice and delivery of home dialysis, but it takes the view that these are unlikely to solve the problem of unwarranted centre variation on their own without a favourable organisational culture, nor be sustainable without dedicated leadership. As such, LOCAL provides a scaffold for these individual interventions, allowing for flexibility in their implementation, which would depend on the local barriers identified as part of quality improvement.

The observation that organisational culture is critical in supporting home dialysis uptake is novel in this context but not surprising. The previous finding of a strong association with physician enthusiasm for home dialysis and its uptake points to this and is likely a surrogate measure for the *value proposition* in the NASSS framework.[32] Organisational culture is recognised as being important in health care, for example patient safety, and is a critical aspect of quality improvement.[57] Variously defined as shared ways of thinking, feeling and behaving, we have been able to describe the key components as they apply to home dialysis while recognising that many of these would also apply to other aspects of kidney care or indeed most areas of health care. What is less apparent is the measures and strategies that can be adopted to instil cultural change, that is the active ingredients needed to facilitate reasoned decision-making between options. Indeed, although we looked for a 'simple' intervention, we could not find an 'off the peg' approach for how to achieve this. One systematic review identified just two controlled before-and-after studies which were positive but were considered to exhibit high levels of bias.[58] A more recent review concluded that there is no 'one size fits all' recipe for culture change and that attention to context is key, identifying three common components associated with success: *diagnosis and evaluation*; *vision and support from leaders and change champions*; *a combination of interventions to develop, embed and sustain change*.[59] These have much in common with the NASSS framework we used and the LOCAL intervention package, which emphasises a common vision, strengthens leadership, encourages diagnosis as part of embedding quality improvement, recommending a combination of

interventions that can be tailored for the local context. It now remains to be seen whether it works in practice and the next steps are to test its application in dialysis centres that are currently failing to meet the recently proposed 20% target for prevalent patients being on home dialysis.

It is also worth comparing LOCAL with other interventions that have been developed to improve choice and uptake in home dialysis. The use of financial incentives (or removing disincentives) works well in a highly monetised healthcare system, such as that in the USA, where a change in the reimbursement bundle in 2008 increased the proportion of people treatment with PD by 50%.[60] However, as a proportion of the total population on dialysis, this remains below the UK and the problem of substantial variation between providers remains. Piloting of a commissioner's target linked to financial penalties in the West Midlands did increase uptake, but it was part of a complex bundle that included visible clinical champions, some extra funding and training, so it is unclear to what extend the financial levers were responsible, and again, substantial between centre variation persisted.[33] LOCAL has left it open for commissioners to employ financial levers, focusing more on how centres behave, given that it was clear from our research that despite the fact that funding of dialysis is the same for all centres in England, via a national tariff, some home dialysis teams perceive that they are under-resourced. This would suggest that it is allocation of resources at a local level that is the issue rather than the whole reimbursement package. In Australia, the introduction of a home incentive payment in 2008 had no impact on home dialysis uptake.[61] The later implementation of a series of key performance indicators, essentially targets backed up by pilot projects, resulted in an increase in PD use from 15.7% to 21.7% of the dialysis population in Victoria between 2012 and 2015, although again, variation by centre remained. Canada has seen more than one attempt to increase home dialysis, including the Alberta Starting Dialysis on Time; the At Home on the Right Therapy (START)[62] project; the Ontario Renal Network Home Dialysis Initiative (2012–9)[63] and a cluster randomised trial of a multifaceted intervention.[64] The START project is in effect a quality improvement programme showing the value of a structured audit programme broken down into discrete steps so that a detailed understanding of the local barriers can be understood. We have recommended this as a quality improvement resource within LOCAL rather than as an alternative, partly because although PD numbers increased (12–18%), the between-centre variation, which varied between 9% and 43%, persisted.[62,65] The Ontario initiative has most similarities with LOCAL and also had some success. The intervention had multiple components, including a new funding model, targets, a network with commitment to home dialysis and culture of accountability, funding of a-PD, financial support for PD catheter insertion and urgent start and the funding of home dialysis co-ordinators that undertook a limited version of the leadership roles identified in LOCAL.[63] Prevalent home dialysis went up from 21.9% to 26.2% over 7 years, but between-centre variation persisted. By contrast, the multifaceted intervention, which included centre-specific audit, distribution of provider and patient-directed educational materials and a visit from a key opinion leader with follow-up support, did not increase the use of home dialysis in 27 of 55 randomly allocated clinics.[64] Of note, none of the above interventions had any effect on the use of h-HD which has proved hard to influence.[7] The only intervention documented to increase h-HD has been the SHAREHD study which encourages patients to take a step-wise approach towards self-care.[66] LOCAL incorporates this approach within its recommendations as a tool for empowering patients.

A major strength of Inter-CEPt is the interdisciplinary nature of the research with the inclusion of several methodological disciplines and expertise from five universities. In particular, how these methodologies were linked together to create a coherent and multifaceted understanding of the problem was a central part of the study. Without a deep understanding of the organisational culture in centres, it is unlikely that we would have included the right questions in our national survey, and this led to important findings that strongly influenced the design of our intervention. It also exposed our lack of expertise in decision science in designing the intervention which led to Hilary Bekker, Professor of Medical Decision-making, joining the research team with the support of the Inter-CEPt steering committee. Other strengths include the first analysis of how patients move through different treatment modalities, which identified that previously recognised health inequalities persist throughout the lifetime of kidney replacement treatment, and a cost–utility analysis of home dialysis using individual patient data and costs that were relevant to England. Inter-CEPt was strongly supported by the UK Kidney charities (NKF, KRUK and Kidney Care UK) and by our steering committee, which included expertise in statistics, health economics and health services had representation from GIRFT and the RSTP. Discussed separately is the support we had from the PAG and stakeholder representation under the section on PPI.

The Inter-CEPt has a number of limitations. The COVID-19 pandemic delayed the start of the project, and because it prevented ethnographers going into sites for several months, this delayed the whole project. The quality of

observations could have been biased by online working, although it is notable that the selected sites managed to maintain a strong home dialysis culture despite these potential limitations. Our decision not to include 'poor' performing sites was based on their likely unwillingness to participate and the low likelihood that observations would influence the intervention. A limitation of the survey was that the number of centres responding to questions relating to specific aspects of service delivery were fewer (typically around half) than those responding to questions relating to clinical leadership, engagement in quality improvement, resources, finance and commissioning. We may therefore have underestimated their importance due to lack of statistical power. This did not apply to questions about PD catheter insertions, which were not associated with likelihood of patients getting on to PD, which is in keeping with the findings of the UK catheter study.[67] Furthermore, the final iteration of the LOCAL intervention package recognises several aspects of service organisation and delivery within its structure, pointing to examples of the patient pathway (catheter insertion, education and complication rates), which would be important areas in which to undertake quality improvement.

Patient and public involvement

Aim of patient and public involvement in Intervening to eliminate the centre-effect variation in home dialysis use

Equity of access to home dialysis is central to patients facing a lifetime of kidney replacement treatment, so the patient voice was essential to the Inter-CEPt project. This included design of the research programme, interpretation of the findings, co-design of the LOCAL intervention and dissemination of the research.

Patient and public involvement methods

Study design Two patients, both with extensive involvement in patient networks, were co-applicants on the original funding proposal, representing different perspectives in terms of treatment modalities, h-HD and PD, north and south geographies and different ethnic backgrounds.

Study management One of the patient co-applicants (DC), remunerated by the research grant via his employment as Patient Partnership Lead for Devices for Dignity, was a full member of the Inter-CEPt study management team. This ensured that the patient perspective was always considered and that the PPI sessions were properly planned with clear objectives. DC also crafted the PPI section of the regular reports to the National Institute for Health Research and attended the meetings with the Inter-CEPt Steering Committee, which was chaired by a patient and included further patient representation from an ethnic minority.

Patient advisory group The PAG was recruited from a number of sources, including the NKF and KRUK patient networks. Care was taken to ensure that it was geographically, gender-wise and ethnically representative. Comprehensive patient support was provided by the Keele University PPI team, which covered study induction, meeting and remuneration management, quality assurance of the experience of the process by the PAG members, including confidential feedback that was relayed to the study team.

Co-design of the Location of Dialysis Care in Kidney Life intervention In addition to the PAG, additional stakeholders were invited to these two sessions.

Outcomes of patient and public involvement and how patient and public involvement influenced the study

Patient and public involvement inputs included seven structured PAG meetings, summarised in *Table 5* along with the two stakeholder workshops and a dissemination meeting (home dialysis summit).

Reflections

Careful recruitment of PAG members, to ensure a broad equality, diversity and inclusion (EDI) characteristics profile and geographic spread, helped to maximise the value added by the group, providing direct experience of hospital processes in different centres across England; and insights into different cultural and religious aspects were particularly valuable. Independent feedback on the planning and content of the PAG meetings was positive. It was recognised that recruiting PAG members from more deprived socioeconomic circumstances is especially challenging.

Equality, diversity and inclusion

Health disparities associated with less advantageous socioeconomic circumstances or coming from an ethnic minority were a key component of the Inter-CEPt and the LOCAL intervention. Initially, at the time of the funding application, we used the term ethnic minority groups to describe all ethnic groups that were non-White, but this term has fallen into disfavour especially since the final report on COVID-19 disparities.[68] We have used the term ethnic minority when referring to all non-White ethnicities as a group, an approach

TABLE 5 Summary of PPI input into the Inter-CEPt study

Date and time of meeting	Topics covered and outcomes of discussions
PAG meeting 20 April 2021, 10.00 a.m.–12.00 p.m.	Introduction to the project and research team Planning of ethnography – including the need to ensure that this explored how the patient's trust in their medical team was achieved, especially for ethnic minorities (to include terminology) – see section on *Equality, diversity and inclusion*
PAG meeting 31 March 2022, 9.30–11.00 a.m.	Interim review of the ethnography and interpretation of findings. This meeting allowed the ethnography team to present their early findings, and DC and SiD then led a discussion. Broadly, the PAG recognised the findings as being correctly interpreted, relating them to their own experiences, giving them context that informed the remaining research
PAG meeting 14 July 2022, 9.30–10.30 a.m.	Finalising interpretation of the ethnography findings and planning of the national survey. This session focused on ensuring that the findings of the ethnography led to the correct questions being asked in the national survey – e.g. were there sufficient questions about engagement with community organisations or local Kidney Patient's Associations
PAG meeting 24 January 2023, 10.00 a.m.–12.00 p.m.	Interpretation of the survey findings and the sequence of regression analysis and their implication for the intervention bundle. The survey findings were presented and discussed, and the outcomes of these discussions informed the content and planning of the workshops
Intervention design workshop 1 The Exchange, Birmingham 24 March 2023	Workshop included patients and carers with lived experience of dialysis (n = 6), kidney doctors (n = 5), nurses (n = 4), other staff (n = 2) and representatives from industry (n = 2). Presentation of the findings of Inter-CEPt to the group. Discussion centred around how services might seek to change organisational culture to become more receptive to supporting home therapies. Scoping of the potential components of the intervention
Intervention design workshop 2 Birmingham University 28 June 2023	Attended by the same stakeholders in workshop 1. Preference was expressed for a distributed leadership model – i.e. that the proposed leadership roles should be distributed among team members, properly empowered and supported by the centre leadership. Discussions generated insights into how the intervention might be adapted for implementation in different organisations and helped to set the proposed interventions in the context of wider patient and community networks, as well as funding and incentive structures
PAG meeting 4 August 2023, 10.00 a.m.–12.00 p.m.	Meeting to obtain feedback on the co-design workshops and the early thoughts that the research team was having about the structure and content of the intervention
PAG meetings 7 February 2024, 10.00 a.m. –12.00 p.m., and 8 February 2024, from 2.00 to 4.00 p.m.	(Two meetings) Finalising of the content of the 'public-facing' report describing the LOCAL service delivery intervention prior to the dissemination event held in March 2024. Finalisation of the name of the intervention, 'LOCAL' agreed. Ensured that the report was accessible and useful to people with kidney failure, e.g. language, inclusion
Home dialysis summit Inter-CEPt Dissemination Event held in collaboration with DAY-LIFE and the UK Kidney Association Held in Birmingham, March 2024	Several members of the PAG attended this event. The morning session of this meeting was devoted to dissemination of Inter-CEPt and LOCAL, alongside a presentation on leadership. The first draft of the 'public-facing' report describing LOCAL was made available prior to the meeting. Following further feedback, a greater emphasis was placed on the importance of patient involvement in designing and in some cases delivering the LOCAL leadership roles and a section on 'next steps' was added

supported by our PAG, which had representation from minorities, and referred to specific groups by name (e.g. Asian, Black, Mixed) while recognising that this still has significant limitations in that it lacks granularity. These arise from how data on ethnicity are collected by the UKRR, which is based on the main categories used in the 2021 census (Asian or Asian British; Black, Black British, Caribbean or African; White and other – e.g. Arab, unknown). An important limitation is the lack of distinction between Asian groups, for example South or East Asian. Socioeconomic status was also obtained from the UKRR and is derived from the Index of Multiple Deprivation (IMD) to rank electoral wards, which can they be mapped to the individual's postcode. The IMD includes seven weighted domains, including income, education, crime, health, employment, barriers to housing and services and the living environment. It is a useful tool at a population level for demonstrating the epidemiology of health disparities and home dialysis use despite potential limitations at the individual level.

Each component of our research was designed to ensure that we had considered EDI. The sites in WP1 were selected on this basis, and it was clear how these centres made

extra efforts to support people from ethnic minorities or more deprived socioeconomic circumstances. The patients involved in the ethnography included representation from all the ethnicity and IMD groups, with over-representation from the more deprived (32 below national median vs. 11 above). Specific questions were addressed on EDI in the national survey (WP2), and the quantitative analyses and economic evaluation incorporated the IMD quintiles and main ethnic groups. The implications of EDI were always discussed at the meetings of the PAG, which had ethnic diversity, but it should be recognised that engaging patients from the most deprived IMD quintiles, who are drawn from volunteers to the charities, is very challenging. Key components of the LOCAL intervention (WP5) that are intended to address health disparities include the strong emphasis on presumption of eligibility for home dialysis, recognition that they will necessitate extra support from the team, provision of a-PD and working closely with community groups and leaders.

Impact and learning

The timing of the dissemination of our research findings has been fortunate as it has coincided with an increased focus on home dialysis. In addition to the aforementioned NKF, GIRFT and RSTP initiatives, the high mortality rate in centre-HD patients during the COVID-19 pandemic shone a light on the national disparities in access to home dialysis. The immediate learnings from Inter-CEPt are that we now have strong evidence for the efficacy of quality improvement, Home Dialysis Roadshows and a-PD in promoting its use. The main dissemination event for Inter-CEPt was at a joint national meeting on home dialysis organised in collaboration with The DAYLife project [supported by the UK Kidney Association (UKKA) and Kidney Quality Improvement Partnership (KQuIP)] in February 2024 at which the Inter-CEPt findings were used to promote their quality improvement activities.

At this meeting, we also launched the LOCAL intervention which is now available online on the KRUK website. The next steps are to work with dialysis centres and their commissioners/regional networks where achieving the new targets for Home Dialysis are proving challenging and trial the intervention, tailored to the circumstances. In the longer term, our economic evaluation would indicate that this investment in service development would benefit both patients and be cost-effective.

Implications for decision-makers

Decision-makers now have the information they need to understand the disparities in the use of home dialysis in England and the steps required to put this right. To act on these, they need to empower the new regional networks to engage with home dialysis and identify centres that are finding it difficult to reach the recently proposed target of 20% of prevalent dialysis patients being at home.

Having said this, decision-makers need to recognise that simply putting a target in place may not result in change. It is clear from Inter-CEPt that organisational culture plays are large part and that changing this will require more than targets and funding. For example, there is an existing tariff to support the extra costs of a-PD and yet there is still a minority of centres that do not offer this service. This need to tackle institutional culture is why the LOCAL intervention has a strong focus on behaviour change. The expectation is that by changing the priority that centres place on home dialysis, they will redirect resource towards this modality which in the long run will pay off. This type of reform in services is undoubtedly in line with current government thinking, which is keen to move health care into the community and encourage greater participation by patients and their families in their treatment.

Research recommendations

Undertake pilots of implementing the Location of Dialysis Care in Kidney Life intervention

This is the next logical step as it would be important to show that the intervention works in different settings. Three to five centres struggling with the new 20% for different reasons should be identified and LOCAL should be tailored to their needs and implemented. This will require a clearer definition of the job descriptions for the distributed leadership roles proposed in LOCAL, which are likely to need modification in line with local staffing and human resources policies.

Wider dissemination of the Location of Dialysis Care in Kidney Life intervention

If the pilots are successful, then integrating the LOCAL intervention into a service specification would be the next goal. Currently, service specifications for PD and home-HD described separately,[29,69] listing the requirements of the service, with clear quality standards, but do not incorporate the characteristics of a service culture and how to achieve this. This will need evidencing, including the need for more robust research design, such as a cluster randomised trial. The only previous such trial, which tested a package of interventions (see *Discussion*) was negative,[64] but it focused on interventions directed towards the patients primarily rather than a targeted attempt at behaviour change.

Generalisability of the Location of Dialysis Care in Kidney Life intervention approach

It is likely that the findings in Inter-CEPt that relate to organisational culture are applicable to many aspects of health care. As already discussed, interventions designed to achieve behavioural change are variably described and poorly evidenced. Further research in this aspect of health care is needed, and building on the experience of implementing LOCAL is likely to be a valuable resource.

Conclusions

The substantial centre-level variation in the uptake of home dialysis in England can be linked to several factors. These include an organisational culture that is supportive of home dialysis, clinical leadership, engagement in quality improvement, provision of a-PD and a perception that developing the service is limited by inadequate resources. Economic evaluation shows that investing resource and effort in home dialysis is cost-effective. People from ethnic minorities and more deprived socioeconomic circumstances are less likely to have dialysis at home over a lifetime of kidney replacement treatment.

Working together with patients, their families and carers, and with healthcare professionals, it was concluded that the service delivery intervention 'LOCAL' should have two key elements: active engagement with quality improvement initiatives that draw on existing approaches to support home dialysis, and the establishment of dedicated leadership roles to embed a favourable organisation culture. Examples of these roles would include championing patient engagement approaches, providing training for non-specialist colleagues, implementing pathway redesign and building relationships with community networks. These activities should be adequately resourced so that the home dialysis team is able to implement them.

Additional information

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Members and attendees of the stakeholder groups

Patients, families and carers: Gill Garnie, Patricia Gooden, Michelle Gooden-Jones, Caryl Bryant, Michael Winfrow, Soumeya Bouacida.

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Patient data statement

This work uses data provided by patients and collected by the NHS as part of their care and support. Using patient data is vital to improve health and care for everyone. There is huge potential to make better use of information from people's patient records, to understand more about disease, develop new treatments, monitor safety, and plan NHS services. Patient data should be kept safe and secure, to protect everyone's privacy, and it is important that there are safeguards to make sure that they are stored and used responsibly. Everyone should be able to find out about how patient data are used. #datasaveslives You can find out more about the background to this citation here: https://understandingpatientdata.org.uk/data-citation.

Data-sharing statement

Fully anonymised data that support the findings of this study are available from the sponsor, Keele University, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are, however, available from the authors upon reasonable request under a data-sharing agreement with Keele University.

Ethics statement

Ethical approval was obtained from the Wales Research Ethics Committee (ref. 20/WA/0249) on 18 September 2020. All participants provided written informed consent to participate in the study.

Information governance statement

Keele University is committed to handling all personal information in line with the UK Data Protection Act (2018) and the General Data Protection Regulation (EU GDPR) 2016/679. Under the Data Protection legislation, Keele University is the Data Controller, and you can find out more about how we handle personal data, including how to exercise your individual rights and the contact details for our Data Protection Officer here: www.keele.ac.uk/legalgovernancecompliance/legalandinformationcompliance/informationgovernance/ or by e-mail: dpo@keele.ac.uk. Data processing (fully anonymised) was undertaken by the researchers at Keele, Birmingham and Sheffield Universities under a data sharing agreement held with the sponsor.

Disclosure of interests

Full disclosure of interests: Completed ICMJE forms for all authors, including all related interests, are available in the toolkit on the NIHR Journals Library report publication page at https://doi.org/10.3310/MZSO4004.

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Award publications

This synopsis provided an overview of the research award *Inter-CEPt: Intervening to eliminate the centre effect variation in home dialysis use*.

Other articles published as part of this thread are:

Allen K, Shaw K, Spry J, Dikomitis L, Coyle D, Damery S, *et al*. How does organisational culture facilitate uptake of home dialysis? An ethnographic study of kidney centres in England. *BMJ Open* 2024;**14**:e085754. https://doi.org/10.1136/bmjopen-2024-085754

Damery S, Lambie M, Williams I, Coyle D, Fotheringham J, Solis-Trapala I, *et al*. Centre variation in home dialysis uptake: a survey of kidney centre practice in relation to home dialysis organisation and delivery in England. *Perit Dial Int* 2024;**44**:265–74. https://doi.org/10.1177/08968608241232200

Potts J, Pearse CM, Lambie M, Fotheringham J, Hill H, Coyle D, *et al*. Patient and center factors in home dialysis therapy uptake: analysis of a UK Renal Registry cohort and a National Dialysis Center survey. *Am J Kidney Dis* 2026;**87**:53–64.e1. https://doi.org/10.1053/j.ajkd.2025.08.012

Potts J, Pearse CM, Lambie M, Fotheringham J, Hill H, Coyle D, *et al*. Health disparities in transitions between kidney replacement therapy modalities and mortality in England: A multistate model using UK Renal Registry data. *PLOS Med*. 2026;**23**:e1004674. https://doi.org/10.1371/journal.pmed.1004674

Hill H, Fotheringham J, Potts J, Solis-Trapala I, Lambie M, Damery S, *et al*. The cost-effectiveness of initiating patients on home dialysis compared with in-centre haemodialysis. *Appl Health Econ Health Policy* 2025;**23**:919–29. https://doi.org/10.1007/s40258-025-00976-7

The following was still under review when this synopsis was published. The following preprint version is available for the reader, please be aware this may not have been peer reviewed:

Weight L, Wiliams I, Bekker H, Coyle D, Fotheringham J, Hill H, *et al*. Development of 'LOCAL', a service delivery intervention to eliminate the centre-effect variation (Inter-CEPt) and optimise home dialysis use. *Pure* 2024. https://doi.org/10.25500/pure.bham.270963859

For more information about this research, please view the award page (www.fundingawards.nihr.ac.uk/award/NIHR128364).

Additional outputs

Tshimologo M, Allen K, Coyle D, Damery S, Dikomitis L, Fotheringham J, *et al*. Intervening to eliminate the centre-effect variation in home dialysis use: protocol for Inter-CEPt – a sequential mixed-methods study designing an intervention bundle. *BMJ Open* 2022;**12**:e060922. https://doi.org/10.1136/bmjopen-2022-060922

'*Location of Dialysis Care in Kidney Life*' public facing report for patients, their families, policy makers, kidney unit staff describing the intervention package, how it was developed and resources available in the Kidney Research UK. URL: www.kidneyresearchuk.org/wp-content/uploads/2024/11/LOCAL-intervention-and-Inter-CEPt-Booklet-June-2024.pdf

This report was presented at a 'Home Dialysis Summit' in March 2024, co-organised by DAYLife, UK Kidney Association and the Inter-CEPt study team, held in Birmingham and attended by patients, family members and > 200 healthcare professionals, including nurses and doctors.

Conference papers

Conference: European Renal Association, Paris, 2024. *Variability of Home Therapies Use in UK Units: Early Results from the Inter-CEPt Study*.

Academy of the Horizon 2020 funded IMPROVE-PD Consortium, November 2022. *Variability of Home Therapies Use in UK Units: The Inter-CEPt – A Mixed Methods Study.*

Conference: UK Kidney Week, June 2023, Newport, Wales. *Intervening to Eliminate the Centre-Effect Variation in Home Dialysis Use (Inter-CEPt): Results from a Survey of Renal Unit Practice in Relation to Home Dialysis Organisation and Delivery in England.*

Conference: UK Kidney Week, June 2023, Newport, Wales. *A Longitudinal Analysis of Home Therapy Uptake in Patients Starting Renal Replacement Therapy in England between 2005 and 2019*.

Meeting of the Home Dialysis Clinical Study Groups: Sheffield, July 2023: *Inter-CEPt Update: Intervening to Eliminate the Centre Effect Variation in Home Dialysis Use: The Inter-CEPt Study*.

Conference: EuroPD, Brugge, November 2023. *Cost Effectiveness of Home Based Therapies – Lessons from Inter-CEPt.*

UK Home Dialysis Summit, Birmingham, March 2024. *How Does Research Inform the National Strategy to Grow Home Dialysis? The Inter-CEPT Study.*

Conference: NIHR Devices for Dignity Intervening to eliminate the centre effect variation in home dialysis use. *Inter-CEPt – Intervening to Eliminate the Centre Effect Variation in Home Dialysis Use (Poster).*

Conference: European Renal Association, Stockholm, 2024.

The future of PD (included presentation of Inter-CEPt results).

Conference: UK Kidney Week, June 2024, Edinburgh Scotland. *An Intervention Bundle to Improve Home Dialysis Uptake: Results of the 'Intervening to Eliminate the Centre Effect Variation in Home Dialysis Use' ('Inter-CEPt') Study*.

Conference: International Society of Peritoneal Dialysis, Dubai, September 2024. *Inter-CEPt: Designing an Evidence-Based Intervention to Reduce Inequity of Access to Home Dialysis*.

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Glossary

Access All types of dialysis require *access to the body* to achieve their aims. For peritoneal dialysis, this requires the insertion of a *peritoneal dialysis catheter* so that fluid can be placed within the peritoneum. For haemodialysis, this requires a *fistula* (artificial surgical connection between as artery and a vein) or an *intravascular catheter* (inserted into a large vein, usually the neck) so that blood can be removed and returned to the body after cleaning in the dialysis machine. Patients on *home haemodialysis* need to learn how to attach their access to the tubes that take the blood to the machine and, when using a fistula, this requires insertion of wide-bore needles. *Buttonholing* is a method of inserting these needles through a track that allows blunt needles to be used and thus is often more acceptable to patients wishing to do home haemodialysis.

Assisted peritoneal dialysis The patient is assisted in doing their peritoneal dialysis by a paid professional (usually a healthcare assistant) who visits once or twice a day. This can be delivered by a private company or by the hospital's home dialysis team. It should be recognised that some patients receive help with their dialysis from unpaid family members.

Automated peritoneal dialysis Peritoneal dialysis that uses a machine to deliver treatment overnight during sleep.

Centre haemodialysis In this method, the patient attends a hospital or satellite unit, typically three times a week as an outpatient to have their treatment.

COM-B: Behaviour (B) change framework that addresses three necessary components: capability (C), opportunity (O) and motivation (M).

Continuous ambulatory peritoneal dialysis Peritoneal dialysis that uses typically three to four manual exchanges of dialysis fluid per day.

Dialysis at Yours: Life fulfilled A project that was launched in 2019 with the aim to improve the quality and uptake of home dialysis in the UK – https://education.ukkidney.org/course/daylife (accessed 15 July 2025).

Haemodialysis A treatment for kidney failure in which the patient's blood is circulated through a machine so as to remove toxic metabolites, electrolytes and water.

Home haemodialysis In this method, the treatment is self-administered at home.

Kidney Quality Improvement Partnership www.thinkkidneys.nhs.uk/kquip/home/ (accessed 15 July 2025).

Making Informed Decisions Individually and Together Used in healthcare framework to support the needs of multiple decision-makers in health and social contexts when making a treatment choice.

NASSS Acronym for the Framework for Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies.

National Kidney Federation Patient-led charity that is the federation of local Kidney Patient Associations.

Peritoneal dialysis A home-based treatment for kidney failure in which the internal lining of the patient's abdominal cavity (peritoneum) is used as an exchange membrane to remove toxic metabolites, electrolytes and water.

Roadshow *Home Dialysis Roadshow* is an event organised by or for a dialysis centre to introduce patients and their families to home haemodialysis and peritoneal dialysis in which they can see the dialysis machines (haemodialysis and automated peritoneal dialysis), talk with and observe patients who are using them to get an in-depth understanding.

Yorkshire Dialysis Decision Aid A resource designed to help patients and their families decide which treatment option (dialysis modality or conservative care) best suits their lifestyle requirements. The information is presented in a even-handed way, using everyday, non-technical language, guiding them through the decision making process by helping them to consider what is important to them. https://kidneyresearchuk.org/wp-content/uploads/2023/03/KR-decision-Aid-2024-P5-Final-artwork.pdf (accessed 15 July 2025).

List of abbreviations

a-PD	assisted PD
APD	automated peritoneal dialysis
CAPD	continuous ambulatory peritoneal dialysis
centre-HD	centre haemodialysis
COM-B	capability (C), opportunity (O) and motivation (M)
EDI	equality, diversity and inclusion
EQ-5D-3L	EuroQol-5 Dimensions, three-level version
GIRFT	Getting It Right First Time
h-HD	home haemodialysis
HD	haemodialysis
HDT	Home Dialysis Treatment
ICHD	in-centre haemodialysis
IMD	Index of Multiple Deprivation
INMB	incremental net monetary benefit
Inter-CEPT	Intervening to eliminate the centre-effect variation in home dialysis use
IQR	interquartile range
KQuIP	Kidney Quality Improvement Partnership
KRT	kidney replacement therapy
KRUK	Kidney Research UK
LOCAL	Location of Dialysis Care in Kidney Life
MIND-IT	Making Informed Decisions Individually and Together
MRC	Medical Research Council
NICE	National Institute for Health and Care Excellence
NKF	National Kidney Federation
PAG	patient advisory group
PD	peritoneal dialysis

PPI	patient and public involvement
QALY	quality-adjusted life-year
RSTP	Renal Services Transformation Programme
START	Starting Dialysis on Time, At Home on the Right Therapy
UKKA	UK Kidney Association
UKRR	UK Renal Registry
WP	work package
WP1	work package 1
WP2a	work package 2a
WP2b	work package 2b
WP2c	work package 2c
WP3	work package 3
WP4	work package 4
WP5	work package 5
YoDDA	Yorkshire Dialysis Decision Aid

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