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Continuous glucose monitoring (CGM) use in people living with diabetes on maintenance dialysis: a retrospective audit and observational cohort study

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Original Article format

Title: Continuous Glucose Monitoring (CGM) use in People Living with Diabetes on Maintenance Dialysis: A Retrospective Audit and Observational Cohort Study

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47 references, 5 tables, 0 figures

Running head: CGM In People with Diabetes on Dialysis

Abstract: 328 words

Background and hypothesis:

The evidence surrounding the long-term benefits of continuous glucose monitoring (CGM) use in people with diabetes on maintenance dialysis remains limited. We investigated the potential benefits of CGM use on long-term glycaemic outcomes in this cohort.

Methods:

A retrospective audit and observational cohort study was undertaken across all hospitals within University Hospitals Birmingham (UHB) NHS Foundation Trust, United Kingdom (UK). Clinical records of 55 adults with diabetes on maintenance dialysis using CGM were accessed. Trends in glycaemic outcomes including haemoglobin A1C (HbA1C), time in range (TIR), time above range (TAR), time below range (TBR), glucose variability, glucose management indicator (GMI), and hypoglycaemic episodes, were recorded for all subjects. Data was analysed using IBM SPSS Statistics (Version 30).

Results:

CGM utilisation was limited to 6.9% of people with diabetes on maintenance dialysis. The median duration on CGM was 26 months (IQR=19,31). The median TIR remained suboptimal at 38%, with only 18.2% (n=10/55) achieving the recommended target of 70% for the general diabetic population. The hyperglycaemic burden was significant, as reflected by a high median TAR (26% for TAR-very high >13.9 mmol/L, 28% for TAR-high 10.1-13.9 mmol/L) and raised mean GMI of 68.76 mmol/mol. 67.3% (n=37/55) of our dialysis cohort experienced at least one hypoglycaemic episode during the last 14-days of CGM use. Only 29.1% (n=16/55) had their insulin regimen changed while using CGM. There was a small but non-significant reduction in HbA1C of 0.3 mol/mol [95% CI -5.58, 6.18; p=0.919] following CGM utilisation.

Conclusion:

Our findings demonstrate high glucose burden and variability in people with diabetes maintained on dialysis. Large-scale real-world studies are needed to understand how to utilise CGM data to guide treatment

adjustments and to establish the benefits of CGM-use on other long-term clinical outcomes in this cohort.

Key learning points

What was known (maximum 50 words): 48 words

- Both hyperglycaemia and hypoglycaemia are common in people with diabetes undergoing long-term dialysis.
- Conventional measures of assessing glycaemic control, including HbA1C level, are unreliable in this population.
- CGM offers dynamic glucose metrics monitoring and has been shown to improve glycaemic control in type 1 and 2 diabetes population.

This study adds (maximum 50 words): 50 words

- Our work represents the first investigation describing the long-term real-world outcomes of routine CGM use in people with diabetes across all dialysis modalities.
- By using the CGM-derived metrics over 14-day and 90-day period, we highlight the considerable burden of both hyperglycaemia and prolonged hypoglycaemia episodes in people with diabetes on dialysis.

Potential impact (on practice or understanding, maximum 50 words): 49 words

- Our findings offer valuable insights into real-world glycaemic patterns and variability in people with diabetes on dialysis, supporting the growing rationale for integrating CGM into routine care pathways.
- Further evidence from larger-scale real-world observational cohort studies are necessary to establish long-term clinical outcomes following continuous CGM utilisation in this population.

Keywords (maximum 5 in alphabetical order)**:**
Continuous glucose monitoring, diabetes, dialysis, hypoglycaemia, time in range.

Clinical trial number: Not applicable

Audit code: CARMS-22522

Introduction

Diabetic nephropathy (DN) is a leading cause of both chronic kidney disease (CKD) and end-stage kidney disease (ESKD) globally. 59% of incident ESKD population in the United States (US) have diabetes, where DN remains as the most common reason for long-term maintenance dialysis treatment (1). DN accounts for approximately one-third of new people starting renal replacement therapy (RRT) in the United Kingdom (UK) (2). In people undergoing long-term maintenance haemodialysis (HD), glycaemic levels at both high and low extremes are well-known to be associated with increased mortality risk (3-6). On the other hand, the relationship between glycaemic control and survival outcome is less well-established in peritoneal dialysis (PD) cohort, with more conflicting data depending on which glycaemic markers are used (7-9).

Both hyperglycaemia and hypoglycaemia are commonly noted in people with diabetes undergoing long-term dialysis (10, 11). People with diabetes on dialysis face distinct glucose management challenges due to the direct effects of dialysis on glucose levels. People on HD experience increased hypoglycaemia risk during dialysis sessions through glucose loss into the dialysate, combined with reduced gluconeogenesis, decreased renal insulin clearance, and impaired hypoglycaemia awareness (12, 13). Post-dialysis hyperglycaemia occurs through counter-regulatory hormonal responses following insulin clearance during dialysis, often coinciding with post-dialysis meals (12, 13). On the other hand, people on PD absorb glucose from dextrose-based peritoneal dialyses, contributing to glucose fluctuations (13, 14).

Studies in people on long-term haemodialysis have identified associations between both glycaemic variability and hypoglycaemia with reduced survival outcomes, indicating the clinical importance of intensive glucose monitoring and management in people with diabetes on dialysis (15, 16). Unfortunately, conventional measures of assessing glycaemic control such as haemoglobin A1C (HbA1C) and fructosamine are unreliable in people with ESKD due to different factors, such as concomitant iron deficiency, anaemia of chronic kidney disease (CKD), recurrent blood transfusions, use of erythropoietin-stimulating agents (ESA), altered insulin clearance, uraemia, and metabolic acidosis (17, 18). Self-monitoring of blood glucose (SMBG) is recommended but requires more than 4 times of finger pricks per day and is associated with considerable inconvenience and poor adherence (19, 20).

Recent developments in diabetes technology have provided new approaches for glycaemic monitoring in people with diabetes on dialysis. One of these is CGM, which are wearable devices that enable patients to track blood glucose levels continuously without requiring finger-prick testing. CGM provides dynamic glucose monitoring capabilities, including detection of hyperglycaemia and hypoglycaemia episodes and their patterns throughout the day (21). CGM-derived metrics, including mean glucose, time above range (TAR), time in range (TIR), time below range (TBR), glycaemic variability (GV), and glucose management indicator (GMI) (22, 23), may inform glycaemic management decisions in people with diabetes on dialysis. These technologies have already been evaluated and adopted widely in both type 1 and type 2 diabetes and have been associated with significant improvements in glycemic control, reduction in hypoglycaemia, and improved quality of life (24-29). A qualitative study by Laursen et al. reported that people who are on haemodialysis expressed positive views regarding CGM use, citing improved understanding, confidence, informed decision-making, and engagement in diabetes management (30).

Both the Kidney Disease: Improving Global Outcomes (KDIGO) and the UK Joint British Diabetes Societies for Inpatient Care (JBDS-IP) guidelines recommend considering CGM use in people who receiving long-term maintenance dialysis (31, 32). However, these recommendations were only based on expert opinions, and the evidence regarding routine CGM use in dialysis population, particularly concerning long-term improvements in glycaemic control and clinical outcomes, remains limited.

The main objective of our study is to understand the potential benefits and impacts of routine CGM use on long-term glycaemic and clinical outcomes in our local dialysis population.

Materials and Methods

Study design and setting

This retrospective audit and observational cohort study was conducted at Queen Elizabeth Hospital Birmingham (QEHB) and three hospital sites (Birmingham Heartlands Hospital, Good Hope Hospital, and Solihull Hospital; collectively known as HGS hospitals) of University Hospitals Birmingham (UHB) National Health Service (NHS) Foundation Trust, UK. UHB delivers tertiary renal services to a catchment population of approximately 1.3 million people across the West Midlands, representing one of the largest renal centres in the UK. The population included all people receiving dialysis therapy during the audit period across the Trust's hospital-based dialysis sites, as well as 13 affiliated satellite dialysis units.

Participants and data sources

All adults with type 1 or type 2 diabetes who were receiving long-term maintenance dialysis and had been using CGM continuously for a minimum of three months between 1st January 2022 and 31st December 2024 were eligible for inclusion. Accepted CGM devices included the Abbott FreeStyle Libre and Dexcom systems. People on all dialysis modalities including in-centre HD, PD, and home HD were included. People were excluded if they had not shared their CGM data with healthcare professionals, as outcomes could not be extracted. In addition, people who were non-adherent to CGM use during the study period (such as less than five scans per day or sensor discontinuation), as well as those who were deceased at the time of data extraction, were excluded from the analysis.

Clinical data collection utilised multiple electronic health record (EHR) systems within the Trust infrastructure. Inpatient admission records were extracted from the Prescribing Information and Communication System (PICS; Birmingham Systems), while outpatient clinic correspondence was accessed through Clinical Portal (Birmingham Systems). Maintenance dialysis treatment information was obtained from either PICS or PROTON (Clinical Computing Ltd), depending on the dialysis units' data management system. CGM-derived glycaemic metrics were directly extracted from manufacturer-specific platforms, including LibreView (Abbott) for people using FreeStyle Libre devices and Dexcom Clarity for those using Dexcom devices.

Study endpoints and outcome evaluation

The primary outcome of our audit was the proportion of people achieving the recommended target TIR of 70% for the general diabetic population over the preceding 14-day period from the time of data download from their CGM portals (23).

The secondary outcomes included other CGM-derived glucose metrics, analysed over both 14-day and 90-day periods from the time of data download. These metrics included mean glucose levels (mmol/L), TAR (%), TIR (%), TBR (%), glucose variability (%), GMI (mmol/mol), and number of hypoglycaemia (≤ 3.9 mmol/L) episodes (23). For people using FreeStyle Libre devices, number of prolonged hypoglycaemia events, defined as hypoglycaemia episodes lasting more than 15 minutes, were also measured over both 14-day and 90-day periods. The temporal patterns of hypoglycaemia episodes were analysed in relation to dialysis and non-dialysis days among both people on in-centre HD and home HD over the 14-day period. To assess longer-term glycaemic control trends, serum HbA1C levels (mmol/mol) were compared between pre-CGM implementation in 2021 and the most recent measurements available in 2024. Current insulin treatment regimens were documented and classified for all participants. Finally, all-cause hospitalisation rates over the preceding 12 months were recorded to evaluation potential associations with glycaemic management and CGM utilisation.

Statistical analyses

All statistical analyses were performed using IBM SPSS Statistics (Version 30), with statistical significance set at $P < 0.05$.

Descriptive statistics were calculated for demographic characteristics, baseline and current maintenance dialysis modalities, diabetes types, CGM device brands, and comorbidities. For CGM-derived glucose metrics and hypoglycaemia episode data, descriptive statistics were generated for the overall cohort and stratified by dialysis treatment modality (in-centre HD and home HD versus PD). Continuous variables were expressed either as mean ± standard deviation (SD) for normally distributed data or median with interquartile range (IQR) for skewed distributions. Categorical variables were presented as frequencies and percentages.

Between-group comparisons of continuous variables were conducted using independent samples t-test for parametric data and Mann-Whitney U test for non-parametric data. Fisher’s exact test was employed to assess differences in categorical variables between dialysis treatment modality groups. Longitudinal changes in glycaemic control were evaluated by comparing serum HbA1C levels between pre-CGM implementation in 2021 and the most recent measurements in 2024 using paired t-tests. Similarly, 12-month all-cause hospitalisation rates were compared between the pre-CGM period in 2021 and the most recent 12-month period in 2024.

Additional descriptive analyses examined insulin therapy regimens across the overall cohort, with calculations of the proportion of people who had insulin regimen modifications following CGM introduction. For people who are on in-centre and home HD, the proportion requiring different insulin regimens or dosing schedules between dialysis and non-dialysis days was determined.

Ethical considerations

The audit was registered with the UHB NHS Foundation Trust Clinical Audit Registration and Management System (CARMS) under audit code CARMS-22522. The audit methodology adhered to standard clinical audit principles, focusing on the evaluation of current clinical practice against established standards of care. All data handling procedures followed UHB NHS Foundation Trust information governance policies and were conducted in accordance with the UK General Data Protection Regulation (GDPR) and Data Protection Act 2018. Data were extracted and stored in an anonymised format to ensure individual confidentiality and comply with data protection regulations. Individual identifiers were removed during the data extraction process, with only anonymised clinical data recorded in the audit database. Access to data was limited to the audit team.

Results

Baseline characteristics

Our cohort comprised 55 people with diabetes receiving maintenance dialysis treatment. Of these, 39 people (70.9%) received care at QEHB; while 16 people (29.1%) were managed at the HGS hospitals. Only 6.9% (n=16/232) of people with diabetes on maintenance dialysis at the HGS hospitals were using CGM. The median duration of CGM use was 26 months (IQR 19-31). Our cohort's baseline characteristics are summarised in Table 1.

Time in Range (TIR)

Glycaemic control was suboptimal in our cohort with only 18.2% (n=10/55) people achieving the recommended TIR target of 70% for the general diabetic population (23). The median TIR over 14-day period was low at 38% (IQR 25-66).

CGM-Derived Glucose Metrics

The CGM-derived glucose metrics are summarised in Table 2. Our cohort exhibited substantial hyperglycaemic burden, demonstrated by high median TAR values over 14-day period of 26% (IQR 6-40) for very high glucose levels (>13.9 mmol/L) and 28% (IQR 21-33) for high glucose levels (10.1-13.9 mmol/L), alongside an elevated mean GMI of 68.76 mmol/mol (SD 15.11). When stratified by dialysis modality, people receiving PD demonstrated significantly lower glucose variability compared to HD population, although no other glucose metrics differed significantly between treatment modalities.

Hypoglycaemia

Hypoglycaemic episodes of blood sugar values less than or equal to 3.9 mmol/L were frequent, affecting 67.3% (n = 37/55) of people over the 14-day analysis period from the time of last data download. The prevalence of hypoglycaemia did not differ significantly between dialysis modalities, with 30 people (69.8%) in the in-centre and home HD group and 7 people (58.3%) in the PD group experiencing at least one episode (p=0.499, Fisher's exact test).

Prolonged hypoglycaemia (episodes lasting >15 minutes) data was only available for the 48 people using Abbott FreeStyle Libre devices. Over the

14-day period preceding the date of data download, 54.2% (n=26/48) of the cohort experienced at least one prolonged hypoglycaemia event, with this proportion increasing to 77.1% (n=37/48) over the 90-day analysis period. The median number of prolonged hypoglycaemic events per person was 1.0 (IQR 0.0-3.8) over 14 days and 4.5 (IQR 1.0-12.8) over 90 days.

Analysis of hypoglycaemia patterns in relation to dialysis sessions revealed important temporal differences among people on in-centre and home HD (n=30). During the 14-day observation period, people experienced a median of 1 (IQR 0-2) hypoglycaemia episode on dialysis days versus 2 (IQR 1-4) episodes on non-dialysis days. A minority of people (10.0%, n=3/30) demonstrated recurrent hypoglycaemia (defined as episodes occurring on at least two dialysis days per week) on dialysis days,. The complete breakdown of numbers and percentages by frequency of hypoglycaemic episodes on dialysis days is presented in Table 3.

Serum HbA1C Levels

To evaluate the impact of CGM implementation on long-term glycaemic control, mean serum HbA1C levels were compared between baseline measurements in 2021 before CGM adoption and the most recent available values in 2024. These results are summarised in Table 4. Following CGM introduction, there was a mean reduction in HbA1C of 0.3 mol/mol; however, this improvement did not achieve statistical significance (95 % CI -5.58, 6.18, p=0.919, paired t-test).

Insulin Dosing Schedules

The insulin therapy regimens of our cohort at the time of CGM data collection are detailed in Table 5. Comparative analysis of glucose metrics between different insulin regimen types was not feasible due to small sample sizes within each treatment category. Following CGM introduction, 16 people (29.1%) underwent modifications to their insulin therapy regimen, potentially reflecting CGM-informed clinical decision-making.

12-Months All-Cause Hospitalisation Rate

Over a period of 12 months of CGM use, the median number of hospitalisations per person increased from 1 (IQR 0-3) in the pre-CGM period in 2021 to 3 (IQR 1-5) in 2024.

Discussion

Our study highlights the excessive burden of hyperglycaemia, high glucose variability and prolonged hypoglycaemia in people with diabetes on long term dialysis and using CGM. Our findings show that nearly 80% of people in this cohort fail to achieve the recommended TIR and were more likely to experience prolonged hypoglycaemia.

There has been an increase in the use of CGM in recent years and the introduction of this technology has been shown to improve glucose control, reduce hypoglycemia and improve quality of life in people with type 1 and type 2 diabetes. The high glycaemic burden noted in our study despite CGM use stands in contrast to the findings in other studies. Several factors may explain these findings. Firstly, very few studies have evaluated the use of CGM in people on dialysis. The inherent fluctuations in glucose levels associated with both HD and PD procedures, particularly following changes to dialysis prescriptions, may limit the effectiveness of CGM-guided interventions (13). Secondly, improvement in glycaemic measures is a consequence of lifestyle and treatment adjustments made in response to CGM profiles. This is potentially new area for most clinicians working in dialysis units and therefore likely that some of the adjustment did not happen. We found that insulin therapy modifications were implemented in only 29.1% of our cohort despite CGM availability, suggesting potential gaps in clinician awareness and knowledge regarding insulin adjustment in people on dialysis. Thirdly, the high recurrence of hypoglycaemia episodes on dialysis days, affecting 10% of people on HD on at least two dialysis days per week, indicates ongoing challenges in glucose management, specifically in preventing hypoglycaemia around dialysis sessions in the HD cohort (33, 34). This finding also contributes to the greater glucose variability observed in the HD cohort compared with the PD cohort, in which dialysis is delivered more continuously (35, 36). Contrary to expectations, the 12-months all-cause hospitalisation rate did not improve following CGM implementation. However, we did not look at causes for hospitalisation in our study, which is a major limitation which impacts on the generalisability of this finding.

Despite endorsement by KDIGO and the UK JBDS-IP guidelines (31, 32), CGM utilisation among people with diabetes on maintenance dialysis remained low in our cohort. Several factors may contribute to this limited adoption: Differences in NHS funding eligibility criteria based on current NICE recommendations (37); regional variations in diabetes technology access across Integrated Care Boards (ICBs) (38); potential inequalities in CGM access (38); limited awareness of CGM utility among nephrologists and people on dialysis; and restricted access to specialist diabetes team with expertise in dialysis care (39, 40). There is evidence to suggest that these limitations can be overcome as was demonstrated by a North Central London kidney satellite unit, which increased CGM utilisation from 4.5% to 89% among eligible people on dialysis following deployment of a specialist diabetes nurse in the dialysis unit and implementation of a joint diabetes-renal care model (41).

Previous research on CGM use in people on dialysis has primarily focused on device accuracy in people on HD, short-term glycaemic metrics, glucose variability between dialysis and non-dialysis days, and hypoglycaemia detection during dialysis sessions (42). There is also evidence to suggest that CGM use may improve the detection of hyperglycaemic and hypoglycaemic events and distinct glycemic patterns related to dialysis sessions (43). However, there is a scarcity of interventional studies looking at long-term benefits of this technology. A systematic review by Zhang et al. (2024) identified only two prospective interventional studies on people on HD with follow-up periods exceeding six weeks, both with small sample sizes and neither assessing CGM-derived glucose metrics comprehensively (44-46). Evidence for CGM use in other RRT modalities including PD and home HD is even more limited (14, 42). While a recent large-scale prospective study by de Boer et al. (2025) evaluated CGM in 420 people across both HD and PD, the analysis was restricted to 10-day glucose metrics (47). In conclusion, the evidence gap regarding long-term benefits of CGM use in people on dialysis remains unaddressed.

To our best knowledge, our study represents the first and largest investigation of long-term benefits of CGM on glucose metrics and clinical outcomes in people with diabetes on maintenance dialysis. The analysis encompasses real-world experience from a large NHS trust over two years and includes all dialysis modalities, also addressing a gap in previous research that predominantly focused on HD population. The audit population demonstrates ethnic and socioeconomic diversity, potentially reducing selection bias compared to previous CGM studies in this population. Although CGM sensor active time was not captured, excluding individuals who did not share CGM data with clinicians or who averaged fewer than five scans per day ensured that our findings reflect glycemic outcomes among patients adherent to CGM use during the study period.

However, several limitations must be acknowledged. Firstly, the observational and cross-sectional design and relatively small sample size limit generalisability of our findings. Secondly, the small number of individuals on PD and home HD also limits the ability to conduct further analyses to further establish factors that may influence the glycemic metrics in these under-investigated cohorts. Thirdly, given the retrospective nature of our study, we could not collect information on adherence to lifestyle factors. While all our patients received education around the use of CGM at the time of initiation, they did not receive any formal lifestyle advice. Different levels of adherence to a healthy diet and exercise levels may therefore have influenced some of these results. In addition to that, the retrospective approach may not reflect the latest clinical practices, particularly given evolving awareness of CGM technology among clinicians and patients over the period of data collection. Furthermore, the absence of a control group prevents the establishment of causal relationships between CGM utilisation and glycaemic outcomes. Finally, the low CGM adoption rate among people on dialysis may have introduced selection bias, with inclusion skewed toward either highly complex individuals selected for CGM use or well-motivated individuals' adherence to modern technology.

Our work highlights several areas requiring further investigation to optimise CGM implementation and effectiveness in people on dialysis. Firstly, given the current evidence limitations, larger scale prospective randomized controlled studies or real-world evaluation research with extended follow-up periods are necessary to evaluate long-term clinical outcomes, including diabetes and non-diabetes related hospitalisation rates, cardiovascular events, and mortality following CGM implementation. Such studies should incorporate diverse populations across different RRT modalities and healthcare settings to ensure generalisability of findings and to fully establish the clinical value and cost-effectiveness of this technology in dialysis populations. Additionally, further research is needed to identify and address barriers to CGM adoption among people on dialysis, including systematic evaluation of healthcare system factors, clinician knowledge gaps, and patient-specific obstacles. Furthermore, investigation of optimal CGM-guided care pathways and decision-support tools specifically designed for people on dialysis may help translate CGM data into meaningful clinical improvements. Finally, research examining the integration of CGM technology with existing diabetes and nephrology care models, like the successful joint diabetes-renal care approach described in the North Central London experience, could provide valuable insights into broader implementation strategies (41).

Abbreviations:

CGM: Continuous glucose monitoring

UHB: University Hospitals Birmingham

UK: United Kingdom

HbA1C: Haemoglobin A1C

TIR: Time in range

TAR: Time above range

TBR: Time below range

GMI: Glucose management indicator

IQR: Interquartile range

CI: Confidence interval

DN: Diabetic nephropathy

CKD: Chronic kidney disease

ESKD: End-stage kidney disease

US: United States

RRT: Renal replacement therapy

HD: Haemodialysis

PD: Peritoneal dialysis

ESA: Erythropoietin-stimulating agent

SMBG: Self-monitoring of blood glucose

GV: Glycaemic variability

KDIGO: Kidney Disease: Improving Global Outcomes

JBDS-IP: Joint British Diabetes Societies for Inpatient Care

QEHB: Queen Elizabeth Hospital Birmingham

HGS: Birmingham Heartlands Hospital, Good Hope Hospital, and Solihull Hospital

NHS: National Health Service

EHR: Electronic health record

PICS: Prescribing Information and Communication System

SD: Standard deviation

CARMS: Clinical Audit Registration and Management System

GDPR: General Data Protection Regulation

NICE: National Institute for Health and Care Excellence

ICB: Integrated Care Board

ERA: European Renal Association

EDNSG: European Diabetic Nephropathy Study Group

Ethics approval and consent to participate:

The audit was registered with the UHB NHS Foundation Trust Clinical Audit Registration and Management System (CARMS) under audit code CARMS-22522. According to the NHS Health Research Authority (HRA) decision tool and the Trust's governance framework, this project met the criteria for a clinical audit and therefore did not require separate NHS Research Ethics Committee approval or individual patient consent. All data handling procedures followed UHB NHS Foundation Trust information governance policies and were conducted in accordance with the UK General Data Protection Regulation (GDPR) and Data Protection Act 2018. The audit was conducted in line with the ethical principles underpinning the Declaration of Helsinki, including those relating to confidentiality and respect for persons.

Consent for publication:

Not applicable.

Availability of data and materials:

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Competing interests:

The authors declare that they have no competing interests.

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Authors' contributions:

C.P.C., S.B., and J.B. were responsible for the conception and design of the protocol for this study. G.J. and J.B. provided data from all sites. C.P.C. performed data collection, analysis and interpretation. C.P.C., S.B., and

J.B. prepared the manuscript, with contributions and approval from all authors prior to final submission.

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Tables + table legends:

Table 1 Baseline Characteristics of People with Diabetes on Regular Maintenance Dialysis and Using CGM

Variable	**Total N = 55**
Sex, n (%)	
Male	39 (70.9)
Female	16 (29.1)
Age [years], median (IQR)	56 (49, 68)
Ethnicity, n (%)	
South Asian	25 (45.5)
Caucasian	24 (43.6)
Afro-Carribean	3 (5.5)
Others/Unknown	3 (5.5)
BMI [kg/m^2], mean ±SD	29.94 ± 6.85
English IMD 2019, n (%)	
10% to 30% most deprived	33 (60.0)
40% to 50% most deprived	9 (16.4)
40% to 50% least deprived	6 (10.9)
10% to 30% least deprived	7 (12.7)
Dialysis modality, n (%)	
In-centre haemodialysis	42 (76.4)
Peritoneal dialysis	12 (21.8)
Home haemodialysis	1 (1.8)
Subtype of diabetes mellitus, n (%)	
T2DM	38 (69.1)
T1DM	16 (29.1)
Post-transplant diabetes mellitus	1 (1.8)
Brands of CGM, n (%)	

Abbott FreeStyle Libre 2 or 2 Plus	48 (87.3)
Dexcom G6	7 (12.7)
Duration on CGM [months], median (IQR)	26 (19, 31)
Complications of diabetes mellitus, n (%)	
Diabetic nephropathy	43 (78.2)
Diabetic retinopathy	36 (65.5)
Diabetic neuropathy or foot disease	24 (43.6)
Other comorbidities, n (%)	
Hypertension	45 (81.8)
Cardiovascular disease	26 (47.3)
Malignancy	10 (18.2)
Dementia	2 (3.6)
Haemoglobin [g/L], mean (SD)	107.3 (16.2)
Erythropoietin-stimulating agent therapy, n (%)	38 (69.1)
Missing data	10 (18.2)

IQR = Interquartile range; BMI = Body-mass index; IMD = Index of Multiple Deprivation; T1DM = Type 1 diabetes mellitus; T2DM = Type 2 diabetes mellitus; CGM = Continuous glucose monitoring; SD = Standard deviation

Table 2 CGM-Derived Glucose Metrics of People with Diabetes on Regular Maintenance Dialysis

Variable	In-centre and home HD N = 43	PD N = 12	Total N = 55	P-value
Mean glucose on CGM [mmol/L], mean (SD)				
14-day period	11.84 (2.90)	12.30 (4.64)	11.94 (3.31)	0.672 *
90-day period	12.19 (2.97)	11.66 (4.28)	12.08 (3.26)	0.620 *
TAR [%], median (IQR)				
Very high > 13.9 mmol/L	32.0 (6.0, 45.0)	24.0 (6.0, 34.5)	26.0 (6.0, 40.0)	0.568 **
High 10.1-13.9 mmol/L	28.0 (21.0, 33.0)	29.0 (16.8, 38.8)	28.0 (21.0, 33.0)	0.713 **
TIR [%], 3.9-10.0 mmol/L, **median (IQR)**	40.0 (24.0, 65.0)	36.0 (29.3, 67.5)	38.0 (25.0, 66.0)	0.976 **
TBR [%], median (IQR)				
Low 3.0-3.8 mmol/L	0.0 (0.0, 2.0)	0.5 (0.0, 1.0)	0.0 (0.0, 1.0)	0.713 **
Very low < 3.0 mmol/L	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.734 **
Glucose variability [%], mean (SD)	34.13 (7.05)	28.23 (5.09)	32.84 (7.07)	0.009 *
GMI [mmol/mol], mean (SD)	67.83 (12.87)	72.21 (22.03)	68.76 (15.11)	0.399 *

Statistical tests: *Independent sample T-test; **Mann-Whitney test

HD = Haemodialysis; PD = Peritoneal dialysis; CGM = Continuous glucose monitoring; SD = Standard deviation; TAR = Time above range; IQR = Interquartile range; TIR = Time in range; TBR = Time below range; GMI = Glucose management indicator

Table 3 The relationship between the number and percentage of ~~patients~~ people on HD and the frequency of hypoglycaemia on dialysis days within a week

Frequency of Hypoglycaemia on Dialysis Days within A Week	Total N = 30
≥ 3 dialysis days/week	1 (3.3)
2 dialysis days/week	2 (6.7)
1 dialysis day/week	18 (60.0)
None	9 (30.0)

Table 4 The measured serum HbA1C levels in 2021 and 2024

	2021 (Before CGM)	2024 (Latest)	P-value
Measured serum HbA1C [mmol/mol],mean (SD)	68.22 (21.86)	63.38 (17.96)	0.919^

Statistical test: ^Paired t-test
CGM = Continuous glucose monitoring; HbA1C = Haemoglobin A1C; SD = Standard deviation

Table 5 The number and percentage of people on different insulin therapy regimen

Insulin therapy regimen	Total N = 55
Basal-bolus regimen	28 (65.1)
Mixed regimen (twice or thrice daily)	2 (4.7)
Intermediate regimen	2 (4.7)
Others	10 (23.3)
Insulin pump	1 (2.3)

Figures + figure legends: NA

Title: Continuous Glucose Monitoring (CGM) use in People Living with Diabetes on Maintenance Dialysis: A Retrospective Audit and Observational Cohort Study

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