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The association between dietetic consultation and time to dialysis for patients attending a pre-dialysis clinic: A retrospective cohort study

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Abstract

Aim: A multidisciplinary approach, including dietetics, is considered the optimal model of care for dialysis preparation. Dietetic consultation (DC) focuses on symptom management and dietary changes to delay time to dialysis. Evidence of the effectiveness of DC on time to dialysis is limited. This study aimed to investigate the impact of DC on time to dialysis for patients attending a pre-dialysis clinic. Methods: A retrospective cohort study was designed to include all patients attending outpatient pre-dialysis clinics at a large metropolitan renal service between January 2014 and March 2018. Time to dialysis (days) was compared between patients that received DC and those who did not. Cox proportional hazards analysis allowing for adjustment of differences and confounders was undertaken. Results: A cohort of 246 patients was identified. Median estimated glomerular filtration rate was 16mL/min per 1.73 m2 (interquartile range = 13-20) at initial pre-dialysis clinic visit and 63% commenced dialysis during the study period. Only 41% of patients received dietetic consultation. Significantly fewer patients needed to commence dialysis in the DC group compared to the no-DC group (hazards ratio 0.63; 95% confidence interval (CI) 0.45-0.89; P = 0.008 Cox proportion hazard). The DC group commenced dialysis significantly later than the no-DC group; 933 days (95% CI 832-1034) versus 710 days (95% CI 630-790) respectively, after the initial pre-dialysis clinic visit; log-rank 0.005. Conclusion: DC provided to patients attending a pre-dialysis clinic was associated with a delayed time to dialysis. Standardised referral pathways to improve patient access to renal dietetic services are recommended to optimise care.

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ABSTRACT

Background: A multidisciplinary approach, including dietetics, is considered the optimal model of care for dialysis preparation. Dietetic consultation focuses on symptom management and dietary changes to delay time to dialysis. Evidence of the effectiveness of dietetic consultation on time to dialysis is limited. This study aimed to investigate the impact of dietetic consultation on time to dialysis for patients attending a pre-dialysis clinic.

Methods: A retrospective cohort study was designed to include all patients attending outpatient pre-dialysis clinics at a large metropolitan renal service between January 2014-March 2018. Time to dialysis (days) was compared between patients that received dietetic consultation and those who did not. Cox proportional hazards analysis allowing for adjustment of differences and confounders was undertaken.

Results: A cohort of 246 patients was identified. Median eGFR was 16ml/min/1.73m^2 (IQR = 13-20) at initial pre-dialysis clinic visit and 63% commenced dialysis during the study period. Only 41% of patients received dietetic consultation. Significantly fewer patients needed to commence dialysis in the dietetic consultation group compared to the no- dietetic consultation group (HR 0.63; 95% CI 0.45-0.89;*P*=0.008 Cox proportion hazard). The dietetic consultation group commenced dialysis significantly later than the no-dietetic consultation group; 933 days (95% CI 832-1034) versus 710 days (95% CI 630-790) respectively, after the initial pre-dialysis clinic visit; log rank 0.005.

Conclusions: Dietetic consultation provided to patients attending a pre-dialysis clinic was associated with a delayed time to dialysis. Standardised referral pathways to improve patient access to renal dietetic services are recommended to optimise care.

Keywords: Chronic kidney disease, pre-dialysis care, dietetic consultation, nutrition therapy, time to dialysis

BACKGROUND

Nutrition therapy is a key component of chronic kidney disease (CKD) treatment[1] and a multidisciplinary team (MDT) approach, including dietetics, has been reported as the most effective model of care for optimal dialysis preparation[2]. Nutrition therapy for pre-dialysis is used to address comorbidities associated with progression (such as hypertension, hyperglycemia and proteinuria), manage nutrition-related uraemic symptoms and reduce the risk of protein-energy malnutrition[2-4]. Adequate caloric intake and reductions in dietary sodium, protein, fluid and electrolytes such as potassium and phosphate (when indicated) are required to manage advanced CKD and progression factors[1, 5-8].

While dietetic consultation (DC) for patients with advanced CKD (Stages 4-5) is recommended[9], standardised referral pathways to dietitians are not commonplace in renal services and DC is often under-appreciated in CKD management[2, 10]. Further, healthcare costs of managing CKD and facilitating dialysis have placed an immense burden on health care systems worldwide[3, 11]. Thus, interventions focused on delaying disease progression have been recommended[12]. Delaying dialysis has been reported by patients as a significant motivator for dietary change[13]. This idea has been mostly explored in patients on dialysis, which may have previously underestimated the role of DC in delaying CKD progression[14]. Whilst pre-dialysis presents an opportune intervention period for CKD, evidence on the impact of DC on

delaying dialysis is limited. It is hypothesised that DC may delay time to dialysis (TTD) and a retrospective study was designed to investigate TTD for patients who received DC compared to those who did not.

MATERIALS AND METHODS

Study Design and Population

This research was a retrospective, multi-center cohort study of patients attending pre-dialysis clinic services within the South Western Sydney Local Health District (SWSLHD) in Sydney, New South Wales (NSW), Australia. This district provides dialysis services to 18% of the NSW population on dialysis[15].

Patients with an estimated glomerular filtration rate (eGFR) <20 ml/min/1.73m^2, are routinely referred to pre-dialysis clinics by their nephrologist. The pre-dialysis clinics are facilitated by a single pre-dialysis nurse who works across three major hospitals within SWSLHD. Following an initial pre-dialysis visit, all patients were offered a referral for DC. The DC was individualised and dependent on each patient's stage of CKD, electrolyte abnormalities present (potassium and phosphate) and nutrition status. Recommendations provided in the pre-dialysis dietetic clinic generally covered a low-moderate protein, low sodium, lower potassium and phosphate diet (as indicated).

All patients who attended the pre-dialysis clinics from January 1, 2014 to June 30, 2016 were included in the study. Patient outcomes were followed until March 31, 2018. This timeframe was chosen to allow for sufficient follow-up of at least 12 months to observe measurable changes in kidney function. Exclusion criteria were

less than 18 years of age, had dialysis education for an acute kidney injury, opted for a non-dialysis therapeutic modality (renal supportive care), commenced dialysis or died within three months of initial pre-dialysis clinic visit, received a transplant prior to dialysis commencement, living with life-limiting morbidities (e.g. terminal cancer and/or concurrent radiotherapy/chemotherapy) and those with missing data such as medical history. Ethics approval for this study was obtained from SWSLHD Human Research Ethics Committee (HE18/196). Requirement for informed consent was waived.

Data Collection

Patients were identified from the database maintained by the pre-dialysis nurse to determine eligibility for the study. Baseline and follow-up data were obtained from electronic medical records and nephrologist clinic letters. Patients were separated into two groups, those who received DC and those who did not. For both study groups, baseline was considered as the date of their initial visit to the clinic with the pre-dialysis nurse. Data collected at baseline included age, gender, primary language spoken, living arrangements, cause of CKD, eGFR (ml/min/1.73m^2, CKD-EPI formula, hospital/private pathology center, within a three month period prior to the initial pre-dialysis clinic visit with the coordinator), co-morbidities and blood pressure control. Co-morbidities included diabetes, hypertension, ischemic heart disease (IHD), cerebrovascular disease, congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), cancer (not undergoing active treatment) and obesity. Blood pressure control was collected within six months prior to baseline and 3-6

100 months post the initial pre-dialysis visit. Well-controlled blood pressure was defined
101 as <140/90mmHg[16].
102
103 For patients who had not commenced dialysis, follow-up consisted of the number of
104 days they remained in the pre-dialysis service and most recent eGFR up until March
105 31, 2018 (within 3-4 months of the follow-up date). For patients that had commenced
106 dialysis or passed away (prior to requiring dialysis) within this time, the date of their
107 first dialysis session or date of death was recorded respectively. Dialysis modality
108 (haemodialysis or peritoneal dialysis), access type (tunneled vascular catheter,
109 arterial-venous fistula or peritoneal dialysis catheter), serum potassium (mmol/L),
110 phosphate (mmol/dL), albumin (μmol/L) and eGFR (ml/min/1.73m^2, CKD-EPI
111 formula) at the first dialysis session were obtained. Additional data collected for both
112 groups included DC (yes/no), number of DC attended, number of hospital admissions
113 and new major adverse cardiac events (MACE), from baseline to follow-up. MACE
114 was defined as cardiac death, nonfatal myocardial infarction, or target lesion
115 revascularization[17]. Myocardial infarction was defined by a rise in high sensitivity
116 troponin T (> 20% increase from previous baseline) in addition to ischaemic
117 symptoms, new electrocardiogram changes, or identification of an intracoronary
118 thrombus by angiography[18].
119
120 Data collection was undertaken by three investigators (SN, LG & PL) and a protocol
121 was developed to ensure agreement on consistent and accurate methods for data
122 collection. Where there was disagreement or ambiguity, discussions between the
123 three investigators and the project supervisors (MM & AM) were undertaken until a
124 consensus was reached. No pre-existing data on TTD based on DC were available to

complete a power analysis. Thus, the study's sample size was based on the number of patients available during the study period.

Patient characteristics were compared to those from the Australian New Zealand Dialysis and Transplant (ANZDATA) registry[15] to assess if the study cohort was a representation of the general Australian population on dialysis. Characteristics compared included gender, age, primary cause of CKD, diagnosis of heart disease, cerebrovascular disease and chronic lung disease.

Statistical Analysis

Continuous variables were assessed for normality using the Shapiro-Wilk test. Normally distributed data are presented as the mean with standard deviation (SD) and assessed between groups using an independent *t*-test. Non-normally distributed data are presented as the median with interquartile range and assessed between groups using the Mann-Whitney U test. Categorical variables were presented as frequency (%) and assessed using the Fisher's Exact or Chi-Square test.

Unadjusted Kaplan-Meier time-to-event curves with log-rank test were used to compare the primary outcome of TTD between the two groups. Participants who had not started dialysis were censored at the set date of follow-up (March 31, 3018). Univariate and multivariate Cox proportional hazard models were used to determine associations between TTD and independent variables. Hazard ratios with 95% confidence intervals were calculated. A step-wise backward regression analysis was used to identify the variables that were independent predictors of TTD from those

found to be significant in the univariate analysis. Variables significantly different between the two groups and known confounders of CKD progression were included in the model. Probabilities for entry or removal of variables from the model were 0.05 and 0.1, respectively.

Missing data was specified and all data available was included in the analysis. There was no imputation of missing data. The data was analysed using Statistical Package for the Social Sciences (SPSS) (Version 25; IBM Corp, Armonk, NY). A *P* value < 0.05 was considered statistically significant. Reporting of this study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines[19].

RESULTS

Baseline Characteristics

A total of 363 patients were seen in the pre-dialysis service between January 2014-June 2016. Overall, 246 patients were eligible for the study and 117 patients were excluded (Figure 1). Data on age, gender, primary language spoken, living arrangements, cause of CKD, eGFR, co-morbidities and starting date of dialysis (if applicable) were collected for 100% of patients. Baseline characteristics of all patients are summarised in Table 1. Despite all patients being offered a dietitian appointment, only 41% (n = 102) accepted DC. Reasons for non-attendance were not recorded. Clinic blood pressure assessments were available for 197 out of 246 patients

(80%). Blood pressure was considered well controlled (target of <140/90mmg Hg) for 65% of patients. No pattern in missing data was identified between the two groups.

Median eGFR at baseline for all patients was 16 ml/min/1.73m^2 (Interquartile Range (IQR) = 13-20) and there was a significant difference between the DC and no-DC groups (DC group median 17 (IQR = 14-22) versus no-DC group median 15 (12-19); *P*=0.005). Patients received DC at a median time of 39 days (IQR 0-99 days) post initial education with the pre-dialysis nurse. Some patients (30%) received DC on the same day they attended the initial pre-dialysis education. Overall, 100% of patients in the DC group attended one consult, 26% attended two consults and 17% attended more than three consults.

A comparison between the study cohort and NSW ANZDATA dialysis population on (supplementary data) was undertaken to assess the difference between the study cohort and general NSW population on dialysis. When compared to the NSW population undertaking dialysis, this study's cohort had a significantly higher proportion of patients with diabetic nephropathy as the cause of CKD (53% versus 33%; *P*<0.001), a higher proportion of patients with diabetes (63% versus 48%; *P*<0.001) and a lower proportion of patients with heart disease (26% versus 37%; *P*<0.001), cerebrovascular disease (8% versus 14%; *P*=0.007) and chronic lung disease (8% versus 16%; *P*<0.001).

Primary Outcome

198 Dialysis was commenced by 155 patients (63%). The median TTD was 451 days
199 (IQR = 278-646) from the initial pre-dialysis clinic visit. Patients in the DC group had
200 a significantly longer TTD compared to the no-DC group (median TTD 523 days
201 versus 375 days, *P*=0.003)(Table 2) and showed a trend towards significance of a
202 lower mortality rate at the end of the follow-up period (8% versus 17%; *P*=0.05).
203
204 Kaplan-Meier unadjusted survival analysis of time in the pre-dialysis service prior to
205 commencing dialysis based on DC (Figure 2) indicated a significant difference
206 between the two groups of 223 days (approximately 7.5 months). DC was associated
207 with a slower progression to dialysis from the initial pre-dialysis clinic visit (933 days
208 (95% CI 832-1034) versus 710 days (95% CI 630-790) respectively; log-rank
209 *P*=0.005).

210 Univariate analysis using a Cox proportional hazards model to assess the association
211 with TTD was shown in Table 3. DC (*P*=0.006), eGFR (*P*<0.001), age (*P*=0.003) and
212 diabetes (*P*=0.005) were significantly associated with TTD (Table 3). The other six
213 variables analyzed, IHD, CHD, COPD, well-controlled blood pressure post pre-
214 dialysis nurse education, not-well controlled blood pressure post pre-dialysis nurse
215 education, language spoken, smoking and gender were not found to be significant.
216
217 Multivariate analysis using a Cox proportional hazards regression model of the four
218 variables found to be significant in the univariate analysis was undertaken (Table 3).
219 DC (HR 0.63, 95% CI 0.45-0.89, *P*=0.008), even when adjusted for other significant
220 variables and face-confounders was associated with a reduction in the risk of
221 commencing dialysis. eGFR at initial pre-dialysis nurse education (HR 0.89, 95% CI
222 0.86-0.92, *P*<0.001) and age at initial pre-dialysis nurse education (HR 0.97, 95% CI

0.96-0.98, *P*<0.001) were associated with a reduced risk of commencing dialysis by the end of the follow-up period. Diabetes (HR 1.81, 95% CI 1.28-2.56, *P*=0.001) was associated with a higher risk of needing dialysis.

DISCUSSION

This retrospective cohort study of patients attending a pre-dialysis service found DC was associated with a significant delay in TTD of 7.5 months and a 37% lower chance of commencing dialysis within the four-year study period. This study adds to the limited literature on pre-dialysis DC outcomes and provides valuable input on the outcome of TTD for a cohort of individuals who received DC and were followed up for >12 months.

A retrospective analysis of TTD over a 10-year follow-up period of 265 patients, found patients with CKD Stages 3-4 that did not receive DC were 3.47 and 3.45 times more likely to commence dialysis, respectively, compared to patients that received DC[3]. This analysis was adjusted for laboratory parameters and diabetes. However, no other confounding factors were analysed. No significant differences were found on TTD based on DC for patients with CKD Stage 5 or those that commenced dialysis <365 days from CKD diagnosis or initial DC. In contrast, the current analysis found a significant difference in TTD for patients with CKD Stage 5 that received DC, indicating a positive association between DC and outcomes even in advanced CKD. This positive difference was observed in the absence of direct measures of patient compliance with DC or the effectiveness of the dietitians' nutrition counseling skills.

Low protein diets implemented with dietetic input in pre-dialysis patients were found to reduce uraemic symptoms, reduce GFR deterioration significantly (4.5mL/min versus 10mL/min over six months) and delay TTD by six months[20]. These results are consistent with our study, which found a difference of approximately 7.5 months in delaying TTD. Uraemic symptoms are known to be primary predictors for dialysis initiation and all cause mortality[21]. Thus, DC aimed at addressing uraemic symptoms such as lower protein diets may have a positive impact on delaying TTD. In a randomised controlled trial, a low protein vegan diet was found to postpone dialysis initiation by 10-11 months in elderly patients with an eGFR of 5-6 ml/min/1.73m^2[22].

Further, the benefits of pre-dialysis DC have been found to extend into the first year of dialysis[10]. A retrospective study that included 156,440 patients on haemodialysis, found significant improvements in mortality (HR 0.85) in patients who received DC for >12 months prior to dialysis[10]. However, only 12% of patients had received pre-dialysis DC as per 2005-2007 US Centres for Medicare & Medicaid Services Medical Evidence Reports. These results are not surprising given Medicare coverage for DC in non-dialysis dependent patients commenced in 2002 and under-utilization of these services by physicians has been documented as a barrier to patients accessing pre-dialysis DC[23]. Instead, DC often occurs for the first time once patients have commenced dialysis, as US dialysis centres are mandated to provide dietetic services[10, 23]. Australian data on the number of patients that receive pre-dialysis DC has not been previously published for comparison. Replication of a similar retrospective cohort study on the impact of DC on TTD with a larger sample size in differing cultural contexts would be useful to confirm the findings presented. This may have implications to strengthen the case for mandating DC into pre-dialysis care.

With average annual heath care costs per patient for dialysis equivalent to AUS$80,000; delaying dialysis should be a target of health service delivery[3, 12]. The results of this study indicate that DC could delay TTD by 223 days. According to the most recent ANZDATA registry report, 2823 patients commenced dialysis in 2016 in Australia[15]. If dialysis commencement could be postponed in patients through DC, this could equate to significant economic savings for health care systems. However, DC is often an overlooked and under-appreciated aspect of CKD management in health service delivery, with reporting of inadequate dietetic staffing to patient ratios[24, 25].

Health economic modeling is often focused on pharmaceutical or surgical treatments that may improve quality and quantity of life in CKD to determine health care spending[11, 26, 27]. A one-year delay in dialysis is predicted to gain 0.6 quality-adjusted life years (QALYs) and 0.3 years in productivity per person(26). Few studies have assessed the cost-effectiveness of DC. The economic benefit of a low protein diet in patients to delay TTD, reported an estimated increase in QALYs of 0.10, 0.39 and 0.93 after 2, 5 and 10 years, respectively[27]. In a US modeling study, renal MDT care, including dietetics, was estimated to add 0.23 QALYs over usual care, reducing the need for dialysis and improving life expectancy for patients with CKD Stages 3-4[28]. This model included 2-4 DC per year for patients with CKD Stages 3-5. Whilst these cost-effectiveness models predict promising outcomes from DC, more health economic studies based on health systems involved are necessary.

Study limitations included the dependence on clinical documentation to undertake data collection. Whilst most data planned for collection was obtained, incomplete medical records were encountered, particularly with blood pressure control. However, this did not have an association with TTD. Proteinuria, a CKD progression factor could not be obtained through clinical documentation. Patients in the no-DC group had a significantly higher prevalence of IHD and COPD and a lower eGFR than those in the DC group at baseline that may have introduced bias. However, IHD and COPD did not show an association with TTD in the analysis. Selection bias is possible, as patients with higher motivation may have accepted the dietetic referral compared to those that declined. Reasons for non-attendance to the pre-dialysis dietetic clinic were not available. The type of DC provided was not collected, thus associations between the different components of dietetic interventions (that is, protein, potassium, phosphate or sodium restriction) could not be made. Lastly, given the retrospective observational nature of the study, the risk of residual confounding factors cannot be excluded and a cause and effect relationship cannot be confirmed.

Despite these limitations, the findings are important for the wider CKD population. The study cohort had a significantly higher co-morbid burden of diabetes and diabetes as the cause of CKD compared to the general CKD population in NSW. In this study, diabetes was found to be negatively associated with TTD (HR 1.81), with these patients commencing dialysis quicker than those without diabetes. In larger observational studies, diabetes has also been found as a predictor of progression to CKD Stage 5(29). Thus, in the wider NSW CKD population that has lower rates of diabetes, DC may potentially delay TTD further compared to the results obtained in this study. Based on the study results, a post-analysis sample size calculation found

the study to be adequately powered. Given the effect of DC, to be able to reject the null hypothesis, 128 control subjects (no-DC) and 91 experimental subjects (DC) were required to reach 80% power. Although, post-hoc calculations are not as reliable as pre-specified power calculations, this may provide guidance for the design of future prospective studies(30).

CONCLUSIONS

DC in pre-dialysis clinics may be considered a useful, potentially cost-saving therapy to delay TTD and reduce eGFR decline. As this study did not address dietary compliance rather just the occurrence of DC, further prospective research is needed to investigate the effectiveness of DC from earlier stages of CKD with eGFR and TTD as primary outcomes. Increased dietetic staffing in renal units and earlier access to dietetic services are recommended to maximise the benefits of DC for CKD management and delay TTD.

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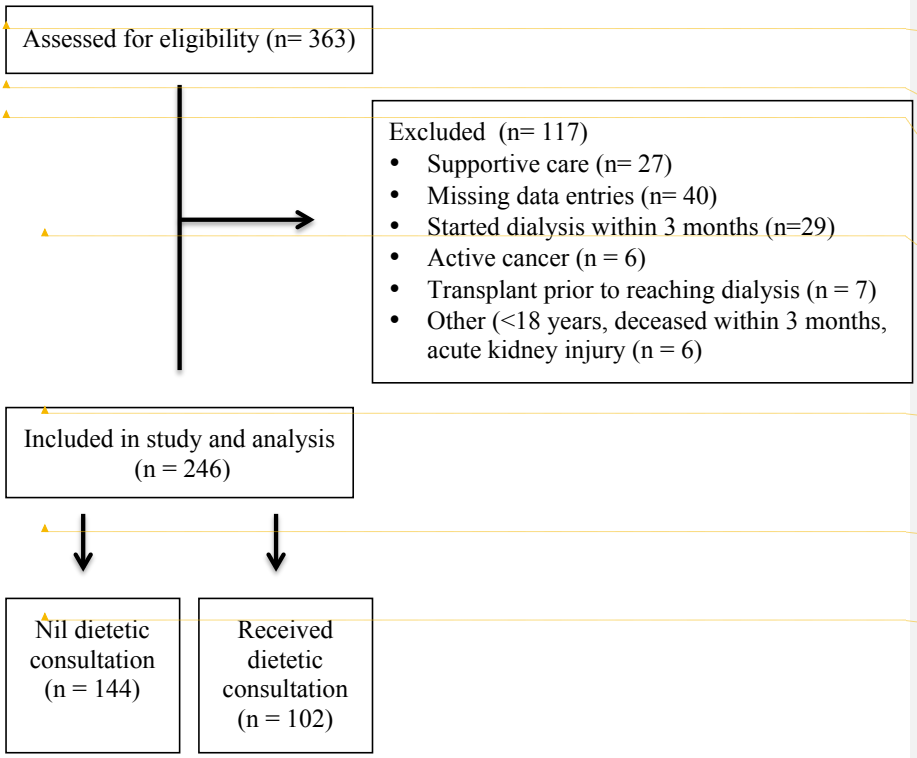

Figure 1: Flow diagram of patients included/excluded in the study.

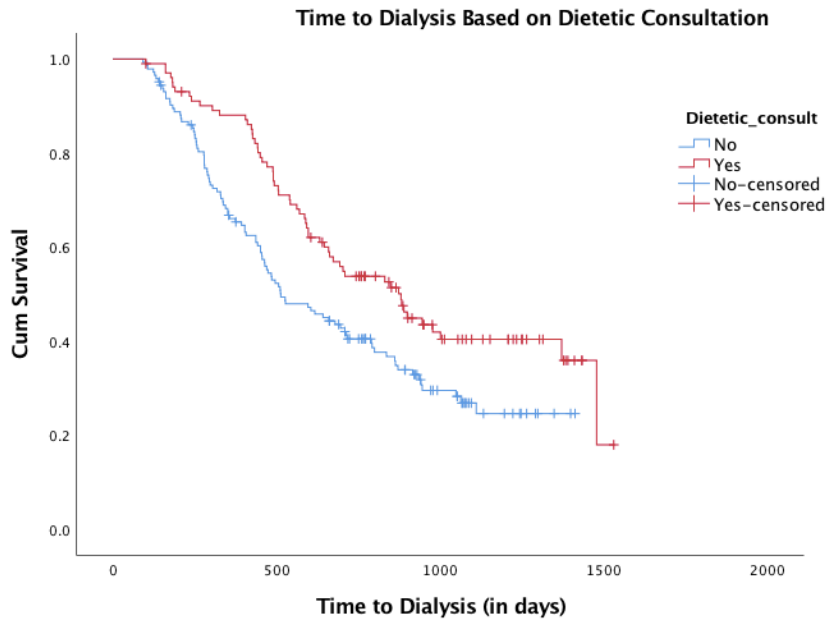

Figure 2: Unadjusted Kaplan-Meier survival analysis for time to dialysis based on dietetic consultation. Log-rank test for equality of survivor functions: *P* Value = 0.005.

Table 1: Baseline characteristics of study participants

Characteristic (Baseline)	Total (n = 246)	Did not receive dietetic consultation (n = 144)	Received dietetic consultation (n = 102)	*P* Value
Age (years)	64 (51-72)	64 (53-72)	63 (50-71)	0.4
Gender				
Male	164 (67)	100 (69)	64 (63)	0.3
Language Spoken				0.006*
English	164 (67)	86 (60)	78 (77)	
Other	82 (33)	58 (40)	24 (23)	
Living arrangements				0.9
Family	213 (87)	125 (87)	88 (86)	
Friends	3 (1)	2 (1)	1 (1)	
Alone	25 (10)	13 (9)	12 (12)	
Other (e.g nursing home, hostel)	5 (2)	4 (3)	1 (1)	
Cause of CKD				0.3
Diabetes	131 (53)	82 (57)	49 (48)	
Hypertension	26 (11)	17 (12)	9 (9)	
Immune-related	39 (16)	23 (16)	16 (16)	
Structural	10 (4)	5 (3)	5 (5)	
Other	12 (5)	4 (3)	8 (8)	
Unknown	28 (11)	13 (9)	15 (15)	
eGFR (ml/min/1.73m^2)				0.003*
<10	25 (10)	10 (7)	15 (15)	
11-20	166 (67)	93 (65)	73 (71)	
21-30	50 (20)	39 (27)	11 (11)	
31-40	5 (2)	2 (1)	3 (3)	
Average	16 (13-20)	15 (12-19)	17 (14-22)	0.005*
CKD Stage				0.002*
3-4	152 (62)	77 (53)	75 (74)	
5	94 (38)	67 (47)	27 (26)	
Co-morbidities				
Diabetes	154 (63)	96 (67)	58 (57)	0.1
Hypertension	225 (92)	130 (90)	95 (93)	0.5
Hyperlipidemia	143 (58)	84 (58)	59 (58)	1.0
Ischemic heart disease	65 (26)	47 (33)	18 (18)	0.01*
Congestive heart failure	29 (12)	21 (15)	8 (8)	0.1
COPD	19 (8)	16 (11)	3 (3)	0.03*
Cerebrovascular disease	20 (8)	13 (9)	7 (7)	0.7
Cancer	25 (10)	13 (9)	12 (12)	0.5
Obesity	71 (29)	35 (24)	36 (35)	0.07
Blood pressure well-controlled (n = 197)	128 (65)	73 (57)	55 (43)	0.9
Currently smoking	17 (7)	10 (7)	7 (7)	1.0

Data are expressed as n (%) or mean (SD) for categorical and continuous parametric data variables, respectively and median (interquartile range) for the non-parametric data. Statistical significance was assessed between the group that did not receive dietetic consultation and the group that received dietetic consultation. CKD indicates chronic kidney disease; eGFR indicates estimated glomerular filtration rate. Fisher's exact test used for categorical variables. Mann-Whitney U test or Independent t-test used for continuous variables. *Indicates *P* value <0.05.

Table 2: Follow-up characteristics and outcomes of study participants

Characteristic (Follow-up)	Total	Did not receive dietetic consultation (n = 144)	Received dietetic consultation (n = 102)	*P* Value
Patients on dialysis	155 (63)	97 (67)	58 (57)	0.1
Time to dialysis (days)	451 (278-646)	375 (253-562)	523 (420-696)	0.003*
Dialysis Modality				0.02*
Haemodialysis	62 (40)	32 (33)	30 (52)	
Peritoneal dialysis	93 (60)	65 (67)	28 (48)	
Access type at dialysis commencement				0.01*
AV fistula/graft	30 (19)	12 (12)	18 (31)	
Vascular catheter	32 (21)	20 (21)	12 (21)	
PD catheter	93 (60)	65 (67)	28 (48)	
Blood test results at first dialysis session				
eGFR (mL/min/1.73m^2)	8 (6-10)	8.0 (6-10)	8.0 (7-11)	0.4
Potassium (mmol/L)	4.8 (0.7)	4.9 (0.7)	4.7 (0.7)	0.06
Phosphate (mmol/L)	1.9 (1.6-2.3)	2.0 (1.6-2.4)	1.9 (1.6-2.2)	0.6
Albumin (μmol/L)	37 (32-41)	37 (31-41)	38 (34-42)	0.1
Drop in eGFR from baseline-follow up (%)	20.7 (5.8-42.6)	24.5 (0-50.5)	18 (8.0-33)	0.1
Patients admitted to hospital pre-dialysis	143 (58)	91 (63)	52 (51)	0.06
Number of hospital admissions/person	1 (0-2)	1 (0-2)	1 (0-2)	0.2
New MACE Event	23 (9)	15 (10)	8 (8)	0.7
Total deaths	32 (13)	24 (17)	8 (8)	0.05
Pre-dialysis (% of deaths)	13	10	3	
Post-dialysis (% of deaths)	19	14	5	
Blood pressure well-controlled (n = 188)	131 (70)	77 (59)	54 (41)	0.8

Data are expressed as n (%) or mean (SD). Statistical significance was assessed between the group that did not receive dietetic consultation and the group that received dietetic consultation. AV indicates arterial-venous; eGFR, estimated glomerular filtration rate; MACE, major adverse cardiac event. Fisher's exact test used for categorical variables. Mann-Whitney U test or Independent t-test used for continuous variables. *Indicates *P* value <0.05.

Table 3: Univariate and multivariate analysis with cox proportional hazard model to examine the effect of variables on time to dialysis (in days).

	Univariate Analysis			Multivariate Analysis		
Variable	**HR**	**95% CI**	***P* Value**	**HR**	**95% CI**	***P* Value**
Age on admission	0.98	0.97-0.99	0.003*	0.97	0.96-0.98	<0.001*
eGFR on admission	0.9	0.87-0.93	<0.001*	0.89	0.86-0.92	<0.001*
Male gender	0.99	0.71-1.38	0.9			
Ischemic heart disease	1.12	0.78-1.6	0.5			
COPD	0.67	0.34-1.31	0.2			
Diabetes	1.61	1.15-2.26	0.005*	1.81	1.28-2.56	0.001*
Congestive Heart Failure	1.06	0.64-1.76	0.8			
BP – well controlled	1.1	0.88-1.41	0.4			
BP – not well controlled	1.06	0.83-1.35	0.6			
English speaking	0.95	0.68-1.33	0.8			
Smoking	1.44	0.8-2.61	0.2			
Dietetic consultation (yes/no)	0.63	0.45-0.87	0.006*	0.63	0.45-0.89	0.008*

COPD indicates chronic obstructive pulmonary disease; eGFR, estimated glomerular filtration rate; BP, blood pressure. *Indicates *P* value <0.05.

Supplementary Material for Online Publication

Table 1: A comparison between the study cohort and the general NSW population on dialysis from Australia New Zealand Dialysis and Transplant Registry.

Variable	NSW (n = 3987)	SWSLHD (n = 246)	P Value
Age			
55-64 years	850 (21)	55 (22)	0.4
Gender			
Male	2463 (62)	164 (67)	0.1
Cause of Chronic Kidney Disease			
Diabetes	1325 (33)	131 (53)	<0.001*
Co-morbidities			
Diabetes	1920 (48)	154 (63)	<0.001*
Heart Disease	1481 (37)	65 (26)	0.001*
Cerebrovascular Disease	570 (14)	20 (8)	0.007*
Chronic Lung Disease	643 (16)	19 (8)	<0.001*

Data are expressed as n (%) NSW indicates New South Wales; SWSLHD, South Western Sydney Local Health District. Chi-square test used to analysis variables.