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Considerations of Nephrologists when Suggesting Dialysis in Elderly patients with Renal failure (CONSIDER): a discrete choice experiment

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ABSTRACT

Background. Nephrologists often face difficult decisions when recommending dialysis or non-dialysis (supportive) care for elderly patients, given the uncertainty around survival and the burden of dialysis. Discrete choice experiments (DCEs) mimic real-world decisions through simultaneous consideration of multiple variables. We aimed to determine the relative influence of patient characteristics on dialysis recommendations.

Methods. We conducted a DCE among Australasian nephrologists consisting of 12 scenarios of two patients (described in terms of age, gender, cognition, comorbidity, life expectancy, current quality of life (QOL), expected QOL with dialysis, social support, patient and family inclination). Nephrologists indicated which patient they preferred recommending dialysis for, or whether they preferred ‘neither’. Mixed logit models determined the odds of recommending dialysis over no dialysis. Trade-offs between QOL and survival were calculated.

Results. A total of 159 nephrologists participated (34% aged 40–49 years, 62% male and 69% Caucasian). All patient characteristics except gender significantly affected the likelihood of dialysis recommendation. Nephrologists were more likely to recommend dialysis for patients with preserved cognition (odds ratio [OR]: 68.3; 95% confidence interval [CI]: 33.4–140.0), lower comorbidity (OR: 2.1; 95% CI: 1.1–4.1), increased life expectancy (OR: 2.8; 95% CI: 2.1–3.7), high current QOL (OR: 2.8; 95% CI: 2.0–3.8) and positive patient and family dialysis inclination (OR: 27.5; 95% CI: 16.2–46.8 and OR: 2.0; 95% CI: 1.3–3.3, respectively). Nephrologists aged >65 were more likely (OR: 11.7; 95% CI: 1.8–77.2) to recommend dialysis. Nephrologists were willing to forgo 12 months of patient survival to avoid substantial QOL decrease with dialysis.

Conclusion. Nephrologists avoided dialysis recommendation if it was expected to considerably reduce QOL. To inform elderly patients’ dialysis decisions, systematic and longitudinal cognition and QOL evaluations are needed as well as better research into understanding patient preferences.

Keywords: decision-making, dialysis, discrete choice, elderly, nephrologist

INTRODUCTION

More than 1.7 million people receive dialysis globally [1]. People aged >75 years are the fastest growing dialysis age group, having increased by 57% over the last decade [2]. Dialysis in elderly patients is likely to enhance survival but can be associated with reductions in quality of life (QOL) [3], decreased independence [4] and substantial time in hospital [5]. Patients who choose not to have dialysis are managed with supportive (non-dialysis) care that entails management of symptoms with medications.

Nephrologists often face difficult treatment decisions for elderly end-stage kidney disease (ESKD) patients with respect to dialysis, on the basis of decreased life expectancy, high treatment burden and evidence that there may be no survival advantage with dialysis for those with higher levels of comorbidity [6]. The treatment decision-making process usually involves input from the nephrologist, the patient and the patient's family, with nephrologists often leading discussions. Factors underlying dialysis decisions may differ between patients and health-care providers, emphasizing the need to understand the factors behind choices in both groups to facilitate transparent shared decision-making [7]. Previous vignette and questionnaire studies [8–10] have found that patients' cognitive state, comorbid burden and QOL are considered important factors in physicians' dialysis recommendations. However, these studies did not allow for estimation of the relative weight of individual factors or the trade-offs that nephrologists might make between different characteristics.

Discrete choice experiments (DCEs) are valid and valuable tools in the exploration of preferences [11, 12]. They are able to simulate real-world decisions through the simultaneous consideration of multiple characteristics and are therefore also able to determine the strength of preferences. They have been applied to chronic kidney disease patients to investigate preferences for organ donation and end-of-life care [13]. Recently, Morton *et al.* [14] using a DCE demonstrated that patients preferred supportive care over dialysis if fewer hospital visits were required and if there was less restriction on a patient's ability to travel. We therefore used a DCE to mimic clinical situations to accurately determine the relative influence of patient characteristics on nephrologists' dialysis recommendations.

MATERIALS AND METHODS

Subjects

All nephrologists and advanced trainees who were members of the Australian and New Zealand Society of Nephrology and had an associated email address were eligible to participate. This study was approved by the University of Sydney Human Research Ethics Committee, protocol number 15193. A DCE was conducted between 11 July 2013 and 27

August 2013. Participants were invited to participate via email that included an anonymized link to the online survey.

Discrete choice experiment

We followed published guidelines for conducting DCEs in health [15]. Potential patient characteristics were identified through a literature review and through consultation with nephrologists in the field. Twenty characteristics were presented to nephrologists in a ranking exercise to distinguish the most important characteristics. Levels were assigned for each characteristic following review of the literature [16, 17] and discussion among the research team.

To assess content validity of the characteristics and their levels, we conducted a pilot DCE with 12 characteristics in 30 nephrologists [18] to ensure thorough and careful selection of attributes for the main DCE. The results from the pilot study including respondents' comments were used to further refine the characteristics and their levels. Poorly interpreted characteristics were clarified, and two characteristics ('cancer history' and 'expected difficulties with dialysis') were omitted to reduce survey complexity. Internal validity of the final model was assessed by checking if the signs of parameter estimates were consistent with our *a priori* expectations. For example, that increasing patient age was associated with a decreasing preference for dialysis.

The final DCE included 10 characteristics, each with two or three levels (age, gender, cognition, comorbid burden, life expectancy, baseline QOL and expected change in QOL with dialysis, social support, patient and family inclination for dialysis) (Table 1). These characteristics were used to describe hypothetical patients, and a statistically efficient survey was designed to organize these characteristics and their levels into choice sets [19]. An efficient survey design optimizes the amount of choice information an analyst can gain from responses to a set of questions. We used a software package Ngene to identify the best combination of attribute levels that minimized overlap, based on our knowledge of prior parameter estimates from the pilot study. Using the regression coefficients from our pilot study, we determined that a sample size

Table 1. Characteristics and their levels in the 12 choice sets

Characteristics	Levels
Patient age	75, 85, 90
Patient gender	Male, female
Patient cognitive state	Normal, somewhat impaired, greatly impaired
Patient comorbid burden	Diabetes, diabetes/coronary artery disease, diabetes/cerebrovascular disease/peripheral vascular disease
Patient life expectancy (with dialysis)	1 year, 3 years, 5 years
Patient QOL (baseline)	Low, medium, high
Patient change in QOL (with dialysis)	Expected to decrease, expected to be maintained, expected to improve
Family/close person support	Low, medium, high
Patient inclination to dialyse	Inclined, undecided, disinclined
Family/close person inclination for patient to dialyse	Inclined, undecided, disinclined

of 110 nephrologists was required to estimate a main effects model. Conditional statements ensured that unrealistic combinations of characteristics were not included. For example, a patient aged 90 years with severe cognitive impairment, diabetes, cerebrovascular disease and peripheral vascular disease did not appear with a corresponding life expectancy level of 5 years.

The final DCE design had 24 choice sets each with two alternatives, blocked into 2 groups of 12 choice sets. Nephrologists were asked which of the hypothetical patients, they would prefer to recommend dialysis to or whether they would recommend dialysis to neither patient (Figure 1). The survey included an introductory statement explaining each characteristic and its levels, an example choice set question, 12 choice questions and socio-demographic questions (age, gender, ethnicity, religion, marital status, practice type and location). We also collected data on attribute non-attendance (whether the respondent ignored a particular attribute in their decision-making), views on primary treatment decision-making (using three Likert scale questions, pertaining to the patient, the patient's family and the nephrologist) and had a free text field for comments. A full copy of the survey is available in the Supplementary Data, Appendix.

Responses from the online survey were exported into a spreadsheet. Each choice set was coded according to attribute levels, respondent preference and respondent socio-demographic characteristics. Categorical attributes, such as cognitive state, were dummy coded. A mixed multinomial logit model (MMNL model or random parameters model) was built to analyse the survey data using Nlogit statistical software [20].

Probabilistic choice models are characterized by the following equation:

$$U = V + \varepsilon,$$

where U is the utility (or satisfaction), V is the observed component of choice between alternatives and ε is the unobserved component or error term. In the MMNL model, one or more

of the parameter estimates are represented as

$$\beta_{nk} = \beta_k + \eta_k z_{nsjk},$$

where β_k is the mean marginal utility in the sampled population and η is the deviation of the mean marginal utility held by the nephrologist for characteristic k belonging to alternative j in choice set s . z_{nsjk} represents an underlying distribution such as $z_{nsjk} \sim N(0,1)$. Our utility function was represented as

$$\begin{aligned} U(\text{dialysis recommendation}) = & \beta_0 + (\beta_1 \times \text{patient_age}) \\ & + (\beta_2 \times \text{gender}) + (\beta_3 \times \text{cognition_normal}) \\ & + (\beta_4 \times \text{cognition_impaired}) + (\beta_5 \times \text{comorbidities_DM}) \\ & + (\beta_6 \times \text{comorbidities_DM_CAD}) + (\beta_7 \times \text{life_expectancy}) \\ & + (\beta_8 \times \text{QoL}) + (\beta_9 \times \text{chQoL_improve}) \\ & + (\beta_9 \times \text{chQoL_decrease}) + (\beta_{10} \times \text{family_support}) \\ & + (\beta_{11} \times \text{patient_inclined}) + (\beta_{12} \times \text{patient_undecided}) \\ & + (\beta_{13} \times \text{family_inclined}) + (\beta_{14} \times \text{family_undecided}) \\ & + (\beta_{15} \times \text{nephrologist_age}) + \varepsilon. \end{aligned}$$

We included all patient characteristics and relevant nephrologist socio-demographic variables that best explained nephrologist choice. All model parameters were initially specified as random allowing for correlated preferences across the choice sets. We used uniform distributions for categorical patient characteristics and normal distributions for continuous patient characteristics. Model fit statistics, including Log likelihood, were assessed after each re-specification, and socio-demographic parameters that were non-significant were dropped if their removal did not significantly compromise model fit. The model was estimated using 1000 Halton draws. Trade-offs between QOL and survival were calculated from the ratio of the relevant mean parameter estimates. Confidence intervals were calculated using the ratios of individual parameter estimates and their standard deviations to present the measure of precision around the benefit/harm trade-off.

	Patient A	Patient B	Neither
Age	90	85	
Gender	Male	Female	
Cognitive state	Normal	Somewhat impaired	
Comorbid burden	CAD, CVD, PVD	CAD, CVD, PVD	
Life expectancy	1 year	1 year	
Quality of life	Medium	Medium	
Change in quality of life	Expected to decrease	Expected to decrease	
Family/close person support	High	Medium	
Patient inclination to dialyse	Undecided	Inclined	
Family/close person inclination to dialyse	Disinclined	Undecided	
Which patient would you prefer to recommend dialysis to?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

FIGURE 1: Example of a question in a DCE of nephrologists' preferences for dialysis recommendation in elderly ESKD patients.

RESULTS

A total of 159 surveys were completed, resulting in 1908 choices for analysis. A third of respondents were aged between 40 and 49 years, 62.4% male and 68.6% Caucasian (Table 2).

Physician preferences

Respondents chose 'neither patient' for 57.3% of the scenarios, and 11 respondents chose the 'neither patient' option in all 12 choice sets. All patient characteristics other than gender were significant predictors of dialysis recommendation (Figure 2). The odds ratios for dialysis recommendation for all characteristics were in the expected directions. Nephrologists were much more likely to recommend dialysis for patients with preserved cognition (odds ratio [OR]: 68.3, 95% confidence interval [CI]: 33.4–140.0) compared to those with severely impaired cognition, and to patients inclined towards dialysis (OR: 27.5, 95% CI: 16.2–46.8) compared to those

Table 2. Characteristics of respondent nephrologists (*n* = 159)

Characteristics	Number	Proportion
Age category		
<30	7	4.5
30–39	42	26.8
40–49	53	33.8
50–65	44	28.0
>65	16	10.2
Gender		
Male	98	62.4
Ethnicity		
Caucasian	107	68.6
Asian	33	21.2
Arab	4	2.6
Other	12	7.7
Marital status		
Single	18	11.5
Married/De facto	132	84.1
Separated/divorced	6	3.8
Widow/widower	1	0.6
Religion		
Buddhism	4	2.6
Christianity	67	42.9
Hinduism	14	9.0
Islam	4	2.6
Judaism	5	3.2
Other religion	2	1.3
No religion	60	38.5
Type of doctor		
Nephrologist	142	91.0
Advanced trainee	14	9.0
Work commitment		
Full time	119	76.3
Part time	32	20.5
Retired	5	3.2
Practice location		
Urban	129	82.7
Rural	26	16.7
Remote	1	0.6
Practice type		
Private	16	10.3
Public	93	59.6
Mix	47	30.1

disinclined. Nephrologists were less likely to recommend dialysis with each year of increasing age (OR: 0.2, 95% CI: 0.2–0.3) and if dialysis was expected to substantially decrease QOL (OR: 0.4, 95% CI: 0.2–0.5).

Nephrologists aged >65 years were more likely (OR: 11.7, 95% CI: 1.8–77.2) to recommend dialysis compared with younger colleagues. Other nephrologist socio-demographic factors such as gender, ethnicity, religion, marital status, practice location or type, hours of clinical nephrology per week or area of expertise had no significant effect on preferences for recommendation of dialysis to elderly patients.

The pseudo R^2 for our MMNL model was 0.48, which is indicative of good model fit [21].

Trade-offs

We calculated the trade-off between survival and QOL and found that nephrologists were willing to forgo 12 months of patient survival (95% CI: 10–14 months) to avoid a substantial QOL decrease with dialysis initiation (that is a decrease in QOL by one level, e.g. from medium to low QOL).

Primary decision-maker

The majority of nephrologists (74.8%) indicated they either 'agreed or strongly agreed' that the patient should be the primary decision-maker. In addition, 71.7% of nephrologists agreed that dialysis decisions should primarily be made by the treating nephrologist compared with 16.4% who indicated that family wishes were of primary importance.

Attribute non-attendance

A total of 62 (39.0%) nephrologists ignored attributes in the hypothetical scenarios. Gender was most commonly ignored (77.4%) followed by family inclination for dialysis (38.7%) and patient age (21.0%) (Figure 3). The least ignored attribute was baseline QOL (3.2%).

Nephrologist comments

Several nephrologists made reference to not liking the phrase 'recommending dialysis' and instead highlighted the importance of patient preference by stating that they presented options to patients and then allowed patients to make their own choice (Table 3). Nephrologists also identified cognition and multi-disciplinary teams (which usually involve nurses, social workers, occupational therapists and other physicians) as influential in decision-making (Table 3).

DISCUSSION

Our study is the first to use a discrete choice methodology to examine nephrologist preferences for elderly patient dialysis recommendations. We have shown that many elderly patient characteristics were highly influential in considerations of nephrologists when recommending dialysis. Nephrologists were much more likely to recommend dialysis to those with normal cognition and those inclined towards entering a dialysis programme. Patient QOL was prominent in decision-making, with nephrologists indicating that they were willing to forgo

Variable	OR (95%CI)
Patient age (per additional year)	0.20 (0.15–0.27)
Gender (females vs males)	1.37 (0.95–1.96)
Cognition severely impaired	(referent)
Cognition normal	68.32 (33.35–139.95)
Cognition impaired	17.50 (8.95–34.22)
Comorbidity CAD, PVD, CVD	(referent)
Comorbidity DM	2.13 (1.11–4.09)
Comorbidity DM or DM + CAD	1.36 (0.75–2.48)
Life expectancy (per additional year)	2.80 (2.14–3.65)
Patient's current QOL (per move to next category)	2.76 (2.01–3.80)
QOL maintained with dialysis	(referent)
QOL improved with dialysis	2.05 (1.04–4.05)
QOL decreased with dialysis	0.35 (0.22–0.54)
Social support for dialysis (per move to next category)	1.43 (1.13–1.82)
Patient disinclined to dialyse	(referent)
Patient inclined to dialyse	27.53 (16.18–46.83)
Patient undecided about dialysis	11.44 (6.88–19.05)
Family disinclined for dialysis	(referent)
Family inclined for dialysis	2.04 (1.28–3.26)
Family undecided about dialysis	1.72 (1.17–2.52)
Respondent nephrologist age >65 years (compared to <65 years)	11.74 (1.78–77.23)

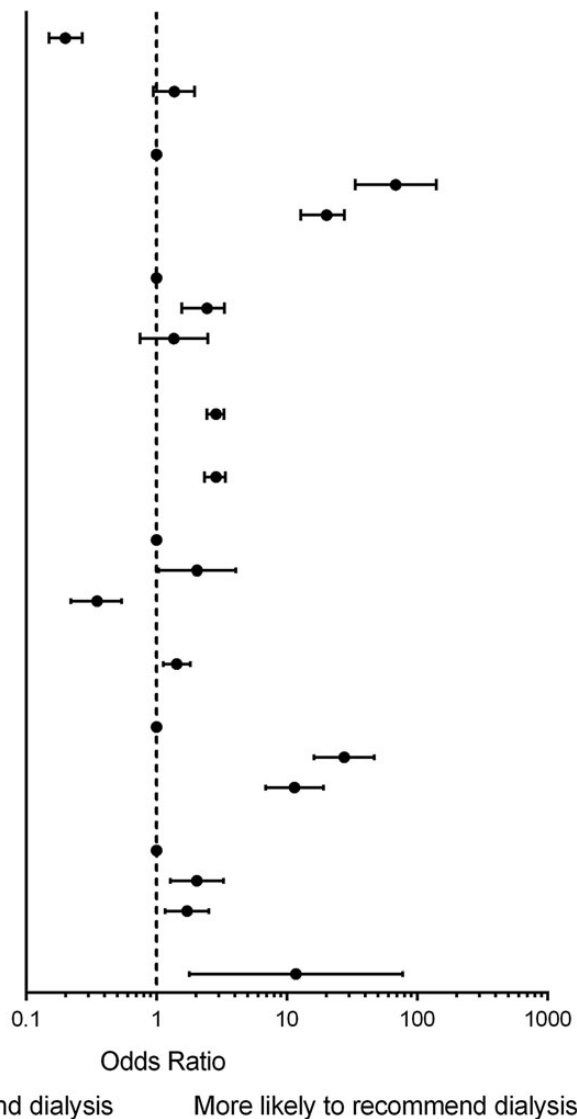


FIGURE 2: Nephrologist preferences for dialysis recommendation in elderly ESKD patients.

12 months of patient survival to avoid a substantial QOL decrease with dialysis initiation. These findings highlight the need for further systematic and longitudinal research into evaluations of cognition and QOL of elderly patients contemplating dialysis decisions.

The US Renal Physicians Association advocates shared decision-making around initiation of renal replacement therapy [22]. They describe this as a 'process by which the physicians and patients agree on a specific course of action based on a common understanding of the treatment goals and risks and benefits of the chosen course compared with reasonable alternatives' [23]. This process, by definition, includes physicians' preferences for dialysis recommendations. It is important that physicians are cognizant of the factors that underpin these preferences to promote objectivity and consistency. Previous studies investigating preferences have predominantly presented clinical vignettes to nephrologists and have demonstrated substantial variation between nephrologists [24], across countries [10] and

across different types of physicians [9]. The factors underlying these decisions varied across the studies and methodologies, but consistently important factors were patient's mental state [8, 24, 25], patient or family request [8, 10, 25], perceptions of QOL [10, 25] along with patients' age and comorbidities [9].

Patient preference was highly influential in nephrologists' dialysis recommendations with nephrologists 28 times more likely to recommend dialysis to patients positively inclined. The eminent role of patients in dialysis decision-making was also supported by our result that 75% of nephrologists felt that patients should be the primary decision-makers and by general survey comments. These findings demonstrate that nephrologists value shared decision-making, but patients clearly require thorough and relevant education to make informed decisions. Studies to-date demonstrate that such education may be sub-optimal by lacking information regarding all available treatment options and detail about the treatment burden on daily lives [25]. Similarly, patients regard physician preferences

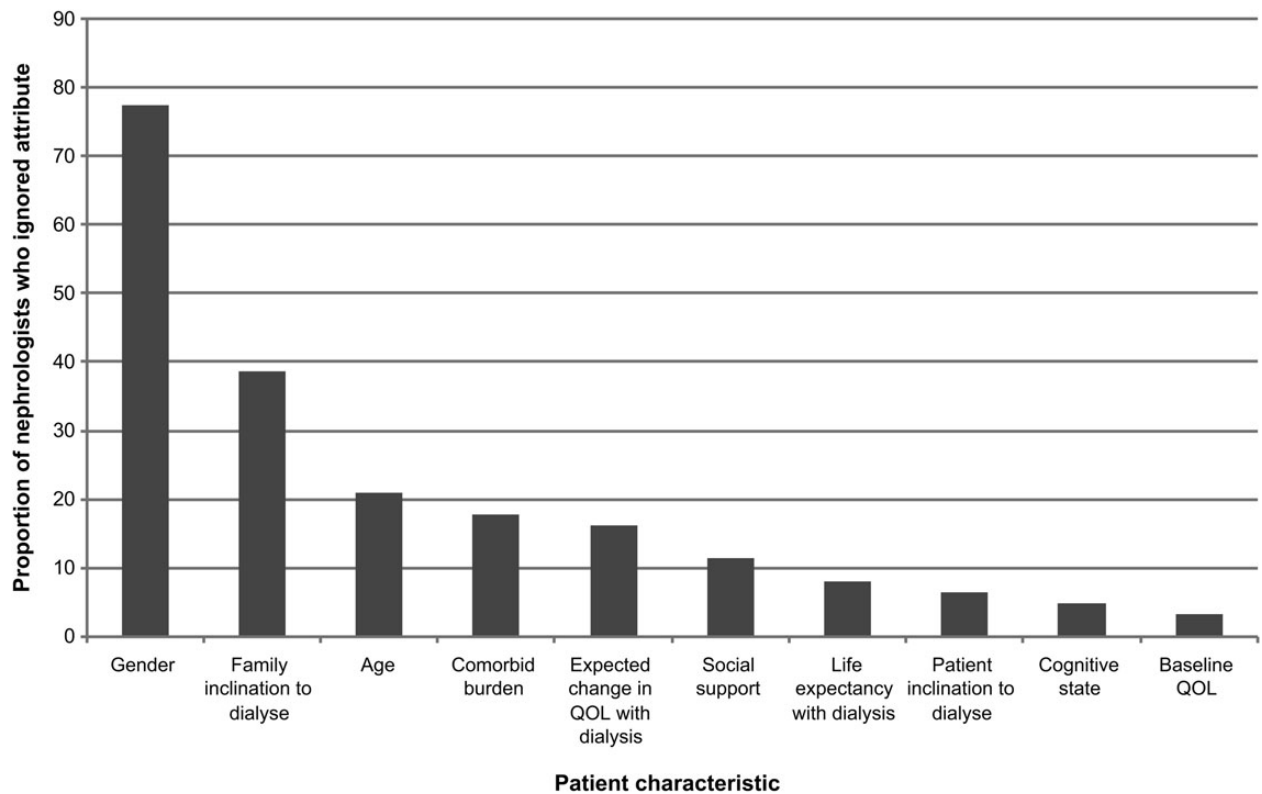


FIGURE 3: Attribute non-attendance ($n = 62$) of nephrologists who participated in a DCE of preferences for dialysis recommendation in elderly ESKD patients.

Table 3. Selection of comments from nephrologists from the main survey

Patient characteristics	Comment
Patient inclination to dialyse	<p>'I think there was one case where life expectancy was only 1 year and possibly one case where the pt was undecided—in these cases I give them the hard facts of dialysis including the morbidity and mortality rates associated with dialysis and let them choose rather than “recommending” dialysis <i>per se</i>.'</p> <p>'I didn't like the “prefer to recommend dialysis.” I don't generally recommend dialysis to anyone. I tell them it's there, how it'll make them feel and whether I think it'll make them live longer. If they want it, they can have it, unless I think they're likely to die on the machine within a week or two.'</p> <p>'Not necessarily always comfortable with the choices to the questions based on “recommending”I present options, though do often indicate whether I think they are likely to benefit or not or will find it difficult etc.'</p>
Cognitive state	<p>'Mild (and ? moderate) cognitive impairment may be related to the CKD, and may improve with dialysis; I don't think severely demented patients should be dialysed.'</p> <p>'My general principles are to avoid dialysis in the population >80 and if they have cognitive impairment.'</p>
Role of multi-disciplinary team	<p>'MDT has important role in decision-making re, offering dialysis.'</p> <p>'Very ideal but in practice there are many other factors and a collective multi-disciplinary team decision is the rule.'</p>

as important. ‘Doctor recommendations’ was the dominant influence in patient’s dialysis modality choice [26, 27], and systematic reviews and synthesis of qualitative studies have highlighted the prominent role of physicians in decision-making for patients and carers in decisions regarding ESKD treatment [28] and decisions concerning conservative treatment and end-of-life care [29].

Patient cognitive state had a substantial influence on nephrologists’ dialysis preferences consistent with the previous literature [8, 25]. Our DCE was able to quantify the strength of this effect, and we found that normal cognitive state increased the likelihood of dialysis recommendation many times over.

Cognitive impairment is a common but poorly recognized problem among elderly ESKD patients. Dementia prevalence was 22% based on medical records in elderly nursing home patients starting dialysis [30] while prevalence of cognitive impairment may be as high as 30–55% based on neuropsychological testing in ESKD patients aged over 75 years [31]. Multiple cognitive assessments exist with which to screen patients and no studies have validated available instruments against clinical diagnoses of dementia in the ESKD population [32]. Uncertainty remains as to which instrument to use for screening given that many are influenced by educational level and language fluency. Our study highlights the need to define the

most appropriate cognitive assessment and employ it routinely to obtain objective assessments of cognition upon which to base treatment decisions.

QOL factored into dialysis recommendations in keeping with previous studies [10, 25]. For the first time, the strength of QOL on decision-making was determined by our DCE design, and we found that nephrologists were willing to forgo 12 months of patient survival to avoid a substantial decrease in QOL following dialysis start. This length of survival trade-off is similar to, albeit slightly lower than the 15 months of life expectancy that patients themselves were willing to give up to decrease their travel restrictions by one level, as reported by Morton *et al.* [14] in a prior patient DCE. Baseline QOL was also the least ignored attribute further highlighting its importance. Despite the firm influence of QOL, little is known about the QOL of elderly ESKD patients, particularly those treated with supportive care. Elderly dialysis patients have reduced QOL compared with age-matched general population peers [33] but have preserved QOL compared with younger patients in whom the perceived QOL loss with dialysis may be greater [34]. Studies on supportive care patients show preserved QOL compared with dialysis in cross-sectional assessments [35], and one prospective study found that almost half of patients experienced significant decreases in life satisfaction with dialysis initiation, whereas it remained stable with supportive care [3]. Physician assessments of QOL are likely to reflect the values, pre-conceptions and biases of the physicians [36], further limiting understanding of patient QOL. Our findings emphasize the need to obtain objective self-reported longitudinal assessments to better understand QOL in the pre-dialysis stage and how it changes over time with different treatments.

Our study is the first to demonstrate the influence of nephrologist age on dialysis recommendations. We found that nephrologists aged >65 years were almost 12 times more likely to recommend dialysis to elderly patients compared with younger colleagues. Importantly, no other socio-demographic factors affected the likelihood of dialysis recommendation. Limited studies have found the opposite effect for physician age in scenarios regarding treatment of elderly incompetent patients with gastrointestinal bleeding [37, 38], and others have found no effect in the setting of elderly patients with cancer [39]. Further qualitative research in this area would assist to clarify the impact of nephrologist age.

This is the first study that has implemented a DCE to evaluate dialysis recommendations of nephrologists for elderly ESKD patients. Our study benefited from its discrete choice design that approximates 'real-life' situations and also requires relatively authentic, rather than hypothetical, decisions to be made by respondents. Our multivariable model had a good fit, indicating that we identified the important and relevant patient characteristics considered by nephrologists in treatment decisions. Our study was limited by the fact that we collected data on nephrologists' stated preferences rather than recommendations made in a clinical setting. There is some suggestion that stated preferences may not always reflect the real decisions that people make [40], but assessing actual treatment decisions would require a very large prospective study. Although our study was larger than many studies in the field

and did reflect the characteristics of Australian nephrologists [41], there is a possibility that physician preferences may differ across geographic and cultural settings.

Cognitive state, patient preference and QOL were the most influential factors when nephrologists are deciding whether to recommend dialysis to elderly patients. Our findings highlight the importance of conducting research into formal and longitudinal assessments of cognitive function and QOL, so that recommendations for dialysis can be based on objective data. The influence of patient preference also means that strategies to improve education regarding dialysis and supportive care that encompasses details on how treatment will affect daily life, functionality and families are urgently needed.

SUPPLEMENTARY DATA

Supplementary data are available online at <http://ndt.oxfordjournals.org>.

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CONFLICTS OF INTEREST STATEMENT

None declared.

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