Abstract

**Background.** The number of elderly patients with chronic kidney disease (CKD) stage 5 is steadily increasing. Evidence is needed to inform decision-making for or against dialysis, especially in those patients with multiple comorbid conditions for whom dialysis may not increase survival. We therefore compared survival of elderly patients with CKD stage 5, managed either with dialysis or conservatively (without dialysis), after the management decision had been made, and explored which of several key variables were independently associated with survival.

**Methods.** A retrospective analysis of the survival of all over 75 years with CKD stage 5 attending dedicated multidisciplinary pre-dialysis care clinics (n = 129) was performed. Demographic and comorbidity data were collected on all patients. Survival was defined as the time from estimated GFR <15 ml/min to either death or study endpoint.

**Results.** One- and two-year survival rates were 84% and 76% in the dialysis group (n = 52) and 68% and 47% in the conservative group (n = 77), respectively, with significantly different cumulative survival (log rank 13.6, P < 0.001). However, this survival advantage was lost in those patients with high comorbidity scores, especially when the comorbidity included ischaemic heart disease.

**Conclusions.** In CKD stage 5 patients over 75 years, who receive specialist nephrological care early, and who follow a planned management pathway, the survival advantage of dialysis is substantially reduced by comorbidity and ischaemic heart disease in particular.

Comorbidity should be a major consideration when advising elderly patients for or against dialysis.

**Keywords:** chronic kidney disease stage 5; comorbidity; conservative management; elderly; survival

Introduction

The annual acceptance rate for renal replacement therapy (RRT) in the UK is rising steadily, from 20 per million population (pmp) in the 1980s to 103 pmp in 2004 [1,2]. Reasons for this include increased referral rates, increased availability/resources and improved ability to treat. Old age is no longer seen as an absolute contraindication to dialysis. Between 1998 and 2004, the percentage of incident patients aged over 75 had risen from approximately 18% to 23% in England and from 20% to 29% in Wales [2]. A strong relationship between increasing age and rising chronic kidney disease (CKD) prevalence has been reported [3,4]. The number of elderly patients with CKD stage 5 is projected to increase considerably in coming years [5]. This is partly due to changes in population age demographics [6], particularly in ethnic minorities and the increasing prevalence of Type II diabetes mellitus [7], but also due to increased recognition and referral of CKD.

For each patient, the decision to commence dialysis or to have conservative management (without dialysis) is complex. It is important to recognize that conservative management (without dialysis) is not simply defined by the absence of dialysis provision: it entails active disease management (for example, active treatment of anaemia) and detailed supportive care, which often becomes increasingly complex towards the end of life. Prognosis, anticipated quality of life (with or without dialysis), treatment burden (if dialysis is undertaken) and patient preferences, all play a part.
in the decision for or against dialysis. The decision becomes increasingly challenging in older patients [8], not because age itself precludes dialysis, but because considerations of comorbidity, reduced overall lifespan and the impact of dialysis itself on quality of life, become more complex with increasing age. Factors influencing the decision, such as length of survival [9–14], determinants of survival [12,15–18], quality of life [9,12,19–22] and disease burden [12], have all been studied in older dialysis patients, but there is little comparative data on survival once the decision has been made. This study intends, therefore, not to elucidate the factors influencing the dialysis decision-making, but instead to evaluate survival once the decision for or against dialysis has been made. The aims of this study were, therefore, to describe and compare survival, once the dialysis decision has been made, in CKD patients over 75 years managed with dialysis and those managed conservatively, and to identify which of several key variables might be independently associated with survival.

**Subjects and methods**

Clinical databases at four major renal units in the South Thames Region were searched for all patients >75 years receiving dedicated multidisciplinary pre-dialysis care, during a 12-month period (from 1 September 2003 to 31 August 2004), and who had chosen either dialysis or conservative management. Dedicated multidisciplinary pre-dialysis care is provided by a team of physicians, specialist nurses, counselors and dieticians providing additional educational, dietary, social and psychological support to that available in the general clinic. Within all four units, all patients predicted to need dialysis within 18 months are directed from general nephrology care into this dedicated multidisciplinary pre-dialysis care. This excludes patients presenting late with previously undiagnosed CKD or in whom a rapid unforeseen deterioration in function has occurred, who are seen within the general nephrology clinics and for whom dialytic therapy tends to be the default option. The main difference between dedicated multi-disciplinary pre-dialysis care and general nephrology care is the time and resources available for education and psycho-social support, and the level of decision-making support provided in anticipation of reaching end-stage renal disease. Classification into dialysis or conservative management was based on planned pathway and analysis was, therefore, on an ‘intention to treat’ basis. Those following the conservative pathway continued to receive dedicated multidisciplinary nephrological care.

The final decision about dialysis was made jointly between each patient and their nephrologist, based on the patient’s wishes and suitability for dialysis. The decision for or against dialysis was determined by the anticipated benefit/burden of receiving dialysis, with particular consideration of quality of life and expected survival on or off dialysis. These (largely unknown) factors are discussed with the patient (and family, according to the patient’s wishes for family involvement), with the emphasis on shared decision-making, unless the patient expressly chooses to hand the decision to their nephrologist (an infrequent occurrence). The decision for or against dialysis is, therefore, usually made together with the patient, according to their preferences and in the light of best estimation of these factors. No patient who wishes to have dialysis is denied this treatment option, though most with very limited prognosis (such as advanced progressive metastatic cancer for which treatment options are exhausted) choose not to have dialytic therapy. Where dialytic therapy might be deemed inappropriate on the grounds of severe comorbidity, the patient would be appraised of the likely difficulties and complications relating to therapy, and the likely lack of benefit, but treatment would not be refused if the individual so wished. Where patients do not have the capacity to make a decision, a judgement on suitability for dialysis is undertaken by the medical professional in conjunction with the patient’s advocate, based on perceived improvement in quality of life and ability to cooperate with treatment.

Estimated glomerular filtration rate (eGFR) was calculated using the six-point Modification of Diet in Renal Disease formula [23]. Patients presenting to nephrology services with eGFR already <15 ml/min, and those with incurable solid organ malignancy were excluded. Data was collected on age, sex, ethnicity, primary renal diagnosis, renal unit, comorbidity score and individual comorbid factors. Ethnicity and primary renal diagnosis were categorized according to Renal Registry categories [2]. Comorbidity was scored according to the system devised by Davies et al., and graded as low (0), medium (1) or high (2) [18]. Data for the individual comorbid factors used to derive the score were also collected. For each eligible patient, the date when eGFR was first <15 ml/min was identified. The study endpoint was 30 June 2005, and it was noted whether each patient was still alive on, or had died before, this date. For those who had died, date of death was recorded. Survival was calculated from the date when eGFR was first <15 ml/min until death (or end of study, if still alive).

Descriptive statistics are presented for dialysis and conservative groups. Mann Whitney U and χ² tests were used to test for differences between the two groups. Kaplan–Meier and log rank test methods were used to estimate and compare survival. Cox proportional hazard regression models were used to investigate the impact of independent variables on survival. Exploratory analysis of the relationship between each single variable and the dependent variable (survival) was carried out, using age, sex, ethnicity, renal diagnosis, comorbidity score, individual comorbidity factors, renal unit and treatment modality (dialysis or conservative), in turn. The independent variables most strongly associated with survival (P values below or close to 0.05) were used in Cox multiple regression analysis to estimate their independent impact on survival. Statistical analyses were performed using SPSS version 12.

**Results**

One hundred and twenty-nine patients (52 dialysis and 77 conservatively-managed) fulfilled the inclusion criteria. Complete information was obtained for all patients, with no missing data. Twenty-four patients who chose the dialysis pathway did not actually receive dialysis during the study period, either because they died unexpectedly before dialysis began (n = 8),
or because dialysis had not started by study end ($n = 16$) (Figure 1). The mean eGFR at dialysis start for those who did start dialysis was 8.1 ml/min. Demographic data, renal diagnosis and comorbidity score are illustrated in Table 1. With the exception of age, statistical comparison did not provide evidence of difference between the two groups. The conservatively managed patients were older (median age of 83.0 years), compared to dialysis patients [median age 79.6 years ($P < 0.001$)]. The two groups were comparable in comorbidity scores, despite the known clinical weight given to comorbidity in the dialysis decision-making process. Median time from when eGFR was first 15 ml/min to death or study end was 588 days (range 67–2528 days) for those patients on dialysis and 540 days (range 4–2193 days) for those managed conservatively.

Of the total of 129 patients in the study, 63 (48.8%) died before the end of the study; 12 from the dialysis group (23% of all dialysis patients) and 51 from the conservative group (66% of all conservative patients) (Figure 1). We were unable to ascertain cause of death sufficiently accurately to provide meaningful data for comparison, particularly in the conservative group, where the majority of deaths occurred in the community. Table 2 shows the 1- and 2-year survival rates according to treatment choice. The superior survival rate of those patients opting for dialysis is further illustrated in Figure 2, which compares overall survival between the two groups (log rank statistic = 13.63, $P < 0.001$). However, as the decision for or against dialysis is particularly challenging in those with high comorbidity, survival was also compared between the dialysis and conservative groups for patients with a comorbidity grade of 2. For patients with high comorbidity, the survival advantage offered by dialysis is no longer apparent, as shown in Figure 3 (log rank statistic < 0.001, df 1, $P = 0.98$).

The impact of the various factors studied on survival was analysed using Cox regression. Initial Cox regression analysis (using each explanatory variable in turn) identified modality choice (regression coefficient $B = 1.128$, $P < 0.001$), age (regression coefficient $B = 0.061$, $P = 0.028$), and comorbidity as being the most strongly associated with survival. With respect to comorbidity, both overall comorbidity score (regression coefficient $B = 0.408$, $P = 0.081$) and ischaemic heart disease alone (regression coefficient $B = -0.678$, $P = 0.001$)
were associated with survival and ischaemic heart disease more strongly than overall comorbidity score. No association with survival was seen for the other variables analysed (renal unit, sex, ethnicity, primary renal diagnosis and the remaining comorbid factors used to construct the Davies comorbidity score). Accordingly, modality, age, overall comorbidity score and ischaemic heart disease were fitted to a Cox regression model, to estimate the independent effect of each. Age and overall comorbidity score did not achieve significance at the 5% level, and were, therefore, removed from the final model. The hazard ratios generated indicate that, in our study, modality and ischaemic heart disease were the most important variables. The regression coefficients, associated P-values, hazard ratios and confidence intervals are shown in Table 3. In the final model, patients who chose dialysis had a better survival (2.9-fold), whereas having ischaemic heart disease reduces survival by just over half.

Table 1. Patient demographic data

<table>
<thead>
<tr>
<th></th>
<th>Dialysis group n = 52</th>
<th>Conservative group n = 77</th>
<th>All patients n = 129</th>
<th>Statistic (comparing dialysis and conservative groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75–79</td>
<td>24 (46.2)</td>
<td>12 (15.5)</td>
<td>36 (27.9)</td>
<td>Mann Whitney U = 1005.00a (P &lt; 0.001)</td>
</tr>
<tr>
<td>80–84</td>
<td>23 (44.2)</td>
<td>36 (46.8)</td>
<td>59 (45.7)</td>
<td></td>
</tr>
<tr>
<td>85–89</td>
<td>5 (9.6)</td>
<td>24 (31.2)</td>
<td>29 (22.5)</td>
<td></td>
</tr>
<tr>
<td>&gt;89</td>
<td>0 (0.0)</td>
<td>6 (5.5)</td>
<td>5 (3.9)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52 (100.0)</td>
<td>77 (100.0)</td>
<td>129 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Sex (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>34 (65.4)</td>
<td>51 (66.2)</td>
<td>85 (65.9)</td>
<td>(\chi^2 = 0.010)</td>
</tr>
<tr>
<td>female</td>
<td>18 (34.6)</td>
<td>26 (33.8)</td>
<td>44 (34.1)</td>
<td>(P = 0.92)</td>
</tr>
<tr>
<td>Total</td>
<td>52 (100.0)</td>
<td>77 (100.0)</td>
<td>129 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>3 (5.7)</td>
<td>4 (5.2)</td>
<td>7 (5.4)</td>
<td>(\chi^2 = 1.290)</td>
</tr>
<tr>
<td>Black</td>
<td>7 (13.5)</td>
<td>7 (9.1)</td>
<td>14 (10.9)</td>
<td>(P = 0.73)</td>
</tr>
<tr>
<td>Chinese</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>df 1</td>
</tr>
<tr>
<td>White</td>
<td>42 (80.8)</td>
<td>65 (84.4)</td>
<td>107 (82.9)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0 (0.0)</td>
<td>1 (1.3)</td>
<td>1 (0.8)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52 (100.0)</td>
<td>77 (100.0)</td>
<td>129 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Renal diagnosis (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aetiology uncertain</td>
<td>12 (23.1)</td>
<td>27 (35.0)</td>
<td>39 (30.2)</td>
<td>(\chi^2 = 9.099)</td>
</tr>
<tr>
<td>Glomerulonephritis</td>
<td>2 (3.8)</td>
<td>2 (2.6)</td>
<td>4 (3.1)</td>
<td>(P = 0.25)</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>2 (3.8)</td>
<td>1 (1.3)</td>
<td>3 (2.3)</td>
<td>df 7</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>13 (25.0)</td>
<td>18 (23.4)</td>
<td>31 (24.0)</td>
<td></td>
</tr>
<tr>
<td>Renovascular disease</td>
<td>7 (13.4)</td>
<td>14 (18.2)</td>
<td>21 (16.3)</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>4 (7.7)</td>
<td>0 (0.0)</td>
<td>4 (3.1)</td>
<td></td>
</tr>
<tr>
<td>Polycystic kidneys</td>
<td>1 (1.9)</td>
<td>1 (1.3)</td>
<td>2 (1.6)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11 (21.1)</td>
<td>14 (18.2)</td>
<td>25 (19.4)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>52 (100.0)</td>
<td>77 (100.0)</td>
<td>129 (100.0)</td>
<td></td>
</tr>
<tr>
<td>Comorbidity score:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 0</td>
<td>8 (15.4)</td>
<td>10 (13.0)</td>
<td>18 (14.0)</td>
<td>(\chi^2 = 0.201)</td>
</tr>
<tr>
<td>Grade 1</td>
<td>34 (65.4)</td>
<td>53 (68.8)</td>
<td>87 (67.4)</td>
<td>(P = 0.90)</td>
</tr>
<tr>
<td>Grade 2</td>
<td>10 (19.2)</td>
<td>14 (18.2)</td>
<td>24 (18.6)</td>
<td>df 2</td>
</tr>
<tr>
<td>Total</td>
<td>52 (100.0)</td>
<td>77 (100.0)</td>
<td>129 (100.0)</td>
<td></td>
</tr>
</tbody>
</table>

*Using age by year not by 5-yr categorized age, although 5-yr categorized age is displayed in the table for simplicity.

Table 2. One- and two-year survival rates

<table>
<thead>
<tr>
<th></th>
<th>Dialysis group</th>
<th>Conservative group</th>
<th>All patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year survival rate</td>
<td>84%</td>
<td>68%</td>
<td>74%</td>
</tr>
<tr>
<td>2 year survival rate</td>
<td>76%</td>
<td>47%</td>
<td>58%</td>
</tr>
</tbody>
</table>

\(P = 0.009\) were associated with survival and ischaemic heart disease more strongly than overall comorbidity score. No association with survival was seen for the other variables analysed (renal unit, sex, ethnicity, primary renal diagnosis and the remaining comorbid factors used to construct the Davies comorbidity score). Accordingly, modality, age, overall comorbidity score and ischaemic heart disease were fitted to a Cox regression model, to estimate the independent effect of each. Age and overall comorbidity score did not achieve significance at the 5% level, and were, therefore, removed from the final model. The hazard ratios generated indicate that, in our study, modality and ischaemic heart disease were the most important variables. The regression coefficients, associated P-values, hazard ratios and confidence intervals are shown in Table 3. In the final model, patients who chose dialysis had a better survival (2.9-fold), whereas having ischaemic heart disease reduces survival by just over half.

Because of the strength of association between ischaemic heart disease and survival identified, this relationship was analysed further. Figures 4A and 4B show the survival curves for patients with and without ischaemic heart disease, again comparing the dialysis and conservative groups. In patients with ischaemic heart disease, there is no evidence that a decision to
follow a dialysis pathway results in an improvement in survival.

Discussion

In this study, patients aged over 75 years, who chose dialysis, had improved survival compared to those who chose conservative management. However, the study indicates that this survival advantage is lost in those with high comorbidity scores, particularly those with ischaemic heart disease. With elderly patients, comorbidity (especially the presence of ischaemic heart disease) should, therefore, be a key consideration in the dialysis decision-making process. This study does not attempt to elucidate the complex process of how and why different dialysis decisions are made. Instead, it describes survival once the decision has been made.

Our findings concur with the conclusions drawn by Smith et al. [13] in their evaluation of non-dialytic management and adds to the evidence informing dialysis decision-making in elderly patients with CKD, particularly those with high comorbidity scores. In patients with significant comorbidity, clinicians need to consider whether dialysis offers sufficient survival benefit for it to be a standard treatment or whether non-dialytic management may offer comparable survival without the treatment burden of dialysis. For those who chose dialysis in the study, we do not know how much of the survival benefit is due to the treatment modality itself and how much reflects bias introduced by the selection process itself. Those choosing dialysis may be more likely to survive because of better physical status or other unknown factors, which are positively associated both with survival and with the decision to have dialysis. It is likely that the factors characterizing these two groups are more complex than can be identified by simple demographic comparators. The retrospective nature of this study did not allow performance scores or other indicators of physical status to be collected, although this is an important consideration for future prospective work. It is worth noting that the demographic comparison identified only age as significantly different. Perhaps most surprisingly, we identified no difference in comorbidity between the two groups. This is in keeping with data published by Joly et al. [14], though Smith et al. identified highly significant differences in comorbidity between those opting for dialysis and those choosing conservative management [13]. These differences may be attributable to the older age in both our study (>75 years) and that by Joly (>80 years), compared with all ages in the study by Smith et al. Comorbidity may discriminate between the

Table 3. Statistics from the Cox regression analysis using the variables of modality and ischaemic heart disease

<table>
<thead>
<tr>
<th>Variable</th>
<th>coefficient (B)</th>
<th>P value</th>
<th>exp(B) (hazard function)</th>
<th>95% CI for exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modality</td>
<td>1.077</td>
<td>0.001</td>
<td>2.937</td>
<td>1.560–5.531</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>–0.590</td>
<td>0.023</td>
<td>0.554</td>
<td>0.333–0.923</td>
</tr>
</tbody>
</table>

Fig. 3. Kaplan–Meier survival curves for those with high comorbidity (score = 2), comparing the dialysis and conservative groups (log rank statistic <0.001, df 1, P = 0.98).

Fig. 4. (A) Kaplan–Meier survival curves for those with ischaemic heart disease, comparing the dialysis and conservative groups (log rank statistic 1.46, df 1, P = 0.27). (B) Kaplan–Meier survival curves for those without ischaemic heart disease, comparing the dialysis and conservative groups (log rank statistic 12.78, df 1, P < 0.0001).
groups less well in older patients, since levels of comorbidity are uniformly high.

Evidence on the factors which influence dialysis decision-making is limited and much of this relates
to decisions on withdrawal of dialysis, rather than
decisions on not starting it. A clinical judgement
analysis undertaken by Kee and colleagues [24]
suggests that the extent to which individual nephrol-
gists vary in their propensity to offer dialysis is
considerable. The same study also identified mental
status as one of the most important considerations in
the decision [24]. RPA/RSN guidelines from the USA
stress the importance of shared decision-making [25].

Shared decision-making requires the patient to be
informed, and as Moss points out, although individual
factors (such as age, nutritional status and functional
status) are known to be powerful predictors of
prognosis, there is no reliable way to combine these
into an overall prognostic indicator to guide the
individual patient and nephrologist [25]. Dealing with
this uncertainty may account for some of the variations
in dialysis decision-making, but also makes it difficult
to measure or standardize dialysis decisions for
comparative purposes in research.

A limitation of this study, therefore, is that these
survival findings may not be generalizable to other
settings if dialysis decision-making differs considerably
in those settings from that undertaken in the study
units—dialysis decision-making, as already indicated,
is known to vary considerably between units and even
between individual nephrologists [24]. It is important
to note that demographic and survival comparisons
between the four units did not uncover any surprising
differences, within the constraints of the small numbers
studied. We recognize that a high overall percentage of
patients elected conservative management; these
numbers have increased in the UK recently, but are not yet
recorded nationally by the UK Renal Registry or by
other national registries such as the US Renal Data
System [26]. The numbers, in this study, are compara-
able with other renal units in the UK [13], although the
percentage choosing conservative management
reported here does not reflect overall dialysis accep-
tance in elderly patients, since dialysis may predomi-
nate in those who present late and are not included in
this analysis. It is notable that no patients on the
conservative pathway, in this study, switched to
dialysis, although they had this opportunity—this
may reflect the level of decision-making support
provided by the multi-disciplinary team approach, or
possibly the older age of this study population;
younger patients may be more likely to switch as
symptoms ensue, but there is little evidence on factors
which influence the switch.

There are other considerations for our study. First,
the study deliberately considered patients who were in
specialist care at a point when their eGFR fell below
15 ml/min. We made this decision in order to avoid the
bias introduced by those presenting late—similar
conclusions cannot be drawn for patients presenting
much later in their disease course, perhaps requiring
more immediate dialysis treatment. Late referrals are
more common in the elderly, and may represent up to
60% of elderly patients presenting with established
renal failure [27]. We recognize the need for evidence in
this late presenting or acute population, but it is clear
that patients who receive early high-quality care and
have time to plan optimum management are likely to
have better outcomes, both in the dialysis and
conservative groups. In this study, we have deliberately
focused on the group with optimal pre-dialysis care,
because a separate study avoids the need to disentangle
the potential bias when both populations are studied
together.

In addition, although the overall numbers (129
patients) were considerable for a study of this type,
where study entry was restricted to elderly patients
with a planned management pathway, in statistical
terms, numbers were relatively small. Likewise, the
number of deaths, particularly in the dialysis group,
was small for statistical purposes, especially when
patients with high comorbidity or ischaemic heart
disease alone were considered. This limited the number
of variables that could be evaluated and for this reason
we focused on those described as important in the
literature. It would have also been useful to establish
the cause of death, in order to determine the
proportions in each group in which death could be
attributable to the renal disease—this is, however,
difficult to ascertain reliably [28,29], and may not,
for this reason, have aided the comparison of the two
groups. Despite these limitations, in patients with high
comorbidity, the absence of a survival difference
between patients opting for dialysis and those who
chose conservative management is striking. There has
been very little comparison of survival between these
two groups in the literature to date, and this study
underlines the need for further research on survival of
conservatively-managed patients. Prospective survival
studies, incorporating greater numbers of patients are
urgently needed, as are studies exploring the reasons
underlying dialysis decision-making, from both patient
and professional perspectives.

There is considerable evidence on survival in elderly
dialysis patients, although survival is usually measured
from dialysis commencement rather than from eGFR
15 ml/min (as in this study), making comparisons
difficult. Median survival time has not been calculated
in our study because of the low death rate in the
dialysis group, which would make a calculated median
survival time very imprecise [30]. Munshi et al. [11],
in a group of dialysis patients over 75 years, identified
1- and 5-year survival rates of 53.5% and 2.4%,
respectively, measured from start of dialysis. Lamping
and colleagues also measured survival in dialysis
patients over 70 years old, in the North Thames
Dialysis Study, and reported 1-year survival rates of
71% [12], which are less than that which we identified
(84%). Survival rates calculated from the start of
dialysis may not account for variations in timing of
dialysis initiation, particularly those consequent on late
nephrology referral which may be more common in the elderly, and which were excluded from our study.

In our experience, elderly patients considering conservative management, frequently ask what their estimated survival without dialysis might be. Existing literature is limited and focuses on survival from the point of dialysis or putative dialysis, and it can be difficult to estimate when this time point might occur. Smith and colleagues report median survival times for both dialysed-palliative (recommended for the conservative pathway, but preferred dialysis) and non-dialysed (recommended for the conservative pathway and agreed not to have dialysis) palliative patients of all ages of 8.3 and 6.3 months, respectively, but relatively small numbers in these groups (n = 10 and 26) make definitive conclusions difficult [13]. Survival was measured from dialysis initiation or ‘putative dialysis initiation’ for those managed without dialysis, with a reported mean eGFR of 8.9 and 9.4 ml/min at onset of dialysis or ‘putative dialysis’. Joly and colleagues followed 107 dialysis and 37 conservatively-managed patients, aged 80 years plus, for over 12 years [14]. Survival was measured from eGFR <10 ml/min, and consequently 1- and 2-year survival rates of 73.6% and 60.0% (in the dialysis group), 29% and 15% (in the conservative group) are considerably less than we identified. Joly et al. also included late referrals (excluded from our study), which differentially biased (reduced) survival times in the conservative group. Kurella et al. used data from the US Renal Data System to report that survival rates for octogenarians and nonagenarians starting dialysis in the US were substantially lower than those previously reported, but were unable to report survival for conservatively-managed patients because theUSRDS does not collect data on patients from whom dialysis is withheld [26]. To the best of our knowledge, our study is the first that attempts to describe survival from eGFR 15 ml/min in patients opting for conservative management, a clinically relevant time point as discussions regarding dialysis (or not) are often in progress at this stage, at least for those patients receiving dedicated pre-dialysis care.

For patients over 75 years with CKD stage 5 who are referred to nephrology care early and who follow a planned management pathway, those choosing to follow a dialysis pathway have a survival advantage. It is not clear whether this survival advantage derives from dialysis itself or from the selection of patients into this management pathway, but nevertheless, comorbidity and ischaemic heart disease in particular, appear to substantially reduce this survival advantage. Comorbidity should, therefore, be one of the main considerations when advising elderly patients for or against dialysis, although further research is needed to clarify and confirm this. Future prospective survival studies should measure eGFR in both dialysis and conservative groups regularly, so as to compare survival at different levels of disease severity, and additional work is needed to explore the determinants of the dialysis decision, from both nephrology and patient perspectives. For those patients with high comorbidity including ischaemic heart disease, conservative management should be considered. Conservative management does not imply ‘not for care’, but rather active disease management and detailed supportive care right up until the end of life.

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