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## Background

Patients with progressive chronic kidney disease (CKD) are at risk of requiring renal replacement therapy (RRT). Early preparation may result in patient anxiety and/or unnecessary dialysis access procedures, which has implications for patient morbidity and healthcare costs. Current risk prediction tools focus on predicting the requirement for RRT/reaching end-stage CKD. We aimed to assess the predictors of mortality in advance of requiring RRT amongst a cohort of patients with CKD known to nephrology services.

## Results

**Results 1: Baseline data.** 3092 patients in the full cohort who died during follow up. Complete data were available for analysis in 780 patients. Mean duration of follow up was 5.2 ± 2.1 years. Baseline demographics are represented below.

Demographics	Died before RRT	Died on RRT	Full cohort	P
Total: n(%)	630 (80.8)	150 (19.2)	780	
Female: n(%)	295 (46.8)	59 (39.3)	354 (45.4)	0.098
Age at start (years)	72.4	62.9	70.6	<0.001
Age at death (years)	77.7	69.5	76.1	<0.001
First GFR (CKD-EPI) (ml/min)	41	33	40	<0.001
Last GFR (CKD-EPI) (ml/min)	24	7	21	<0.001
Deprivation (SIMD)	2	2	2	0.725
PMH CVD: n(%)	227 (36.0)	30 (20.0)	257 (32.9)	<0.001
PMH CHD: n(%)	131 (20.8)	15 (10.0)	146 (18.7)	0.002
PMH HF: n(%)	69 (11.0)	10 (6.7)	79 (10.1)	0.118
PMH PAD: n(%)	53 (8.4)	10 (6.7)	63 (8.1)	0.481
PMH DM: n(%)	177 (28.1)	39 (26.0)	216 (27.7)	0.607
PMH HTN: n(%)	264 (41.9)	61 (40.7)	325 (41.7)	0.783
Use of ACE/ARB: n(%)	355 (56.3)	114 (76.0)	469 (60.1)	<0.001
SBP (mmHg)	148	154	149	0.016
DBP (mmHg)	73	79	74	<0.001
MAP (mmHg)	98	104	99	<0.001
uPCR (mg/mmol)	52	244	71	<0.001
BMI (kg/m <sup>2</sup> )	28.6	26.9	28.3	0.007

GFR - glomerular filtration rate; SIMD - Scottish Index of Multiple Deprivation; PMH - past medical history; CVD - cerebrovascular disease; CHD - coronary heart disease; HF - heart failure; PAD - peripheral arterial disease; DM - diabetes mellitus; HTN - hypertension; SBP - systolic BP; DBP - diastolic BP; MAP - mean arterial pressure; uPCR - urine protein:creatinine ratio. Data are represented as mean; median given for SIMD and uPCR.

**Results 2: Competing risk regression analysis (subdistribution hazards model) showing factors that were significantly associated with mortality in advance of RRT.** uPCR was log transformed before analysis.

Factor	SHR	95% CI	P
Female	1.207	1.037-1.405	0.02
Age (years)	1.051	1.041-1.061	<0.001
GFR (ml/min)	1.019	1.014-1.024	<0.001
Log uPCR	0.881	0.825-0.941	<0.001
MAP (mmHg)	0.993	0.988-0.998	0.007
BMI (kg/m <sup>2</sup> )	1.018	1.010-1.027	<0.001
Bicarbonate (mmol/l)	1.030	1.014-1.045	<0.001

Subdistribution hazard ratio (SHR) for risk of mortality before RRT for an increase of one unit of each of the factors listed.

## References

1: Scrucca L, Santucci A, Aversa F. "Regression modelling of competing risk using R: an in depth guide for clinicians". Bone Marrow Transplantation (2010); 45: 1388-1395. 2: Fine JP, Gray RJ. "A proportional hazards model for the subdistribution of a competing risk." J Amer Statist Assoc (1999); 94: 496-509

## Methods

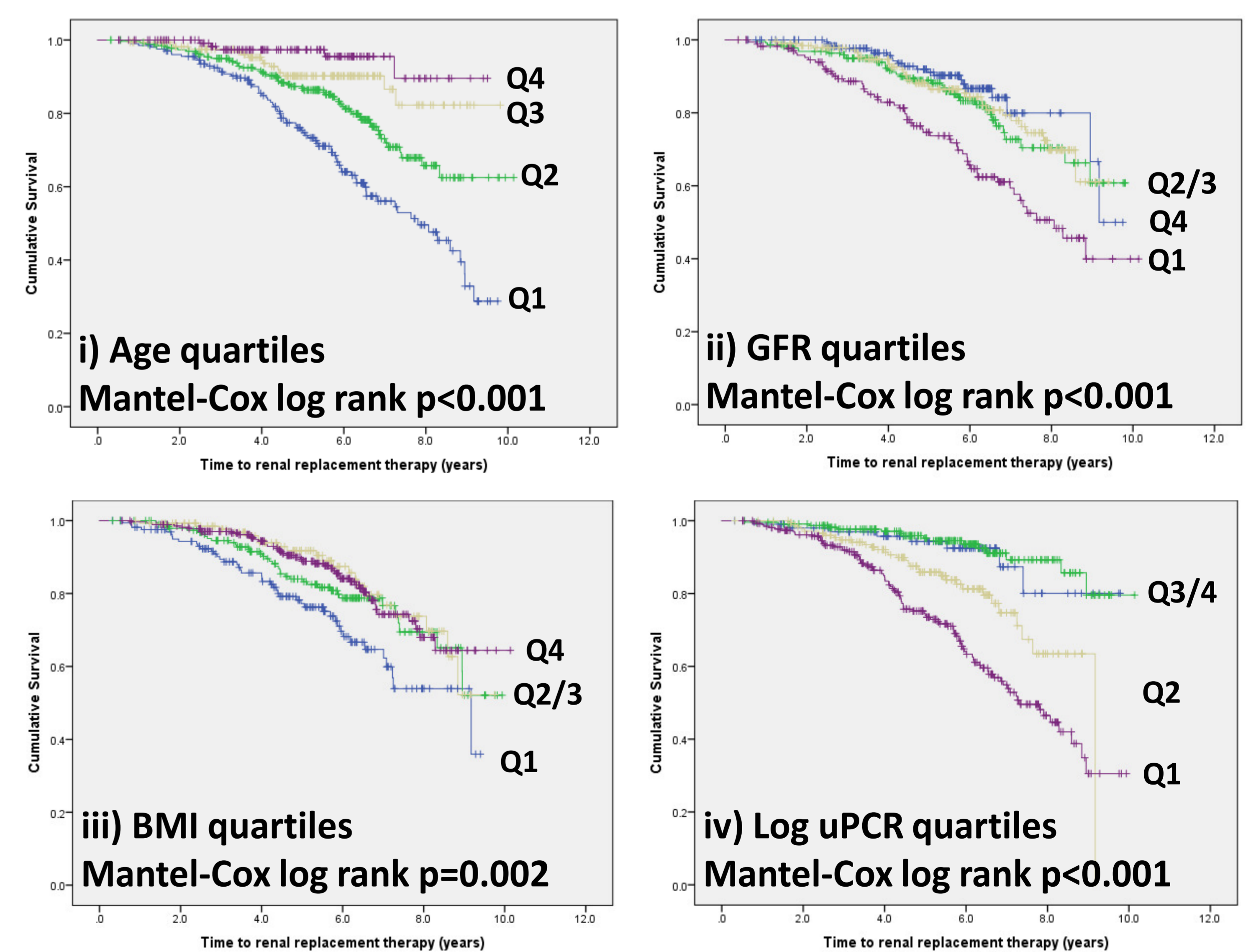
We extracted baseline demographic, clinical and biochemical data for patients with CKD stored in the electronic patient record from 01/01/2006 to 05/05/2016. We included patients who had died at time of data collection. Glomerular filtration rate (GFR) was calculated from serum creatinine by CKD-EPI. We assessed factors associated with progression to RRT using the subdistribution hazards model<sup>1</sup> in order to account for competing risk of RRT. Analyses were conducted in R Studio (version 1.0.136). We used the *crr* package for R statistical software using a method described previously<sup>2</sup>.

**Results 2. Competing risk analysis for factors significantly associated with mortality, analysed in quartiles.** Risk of mortality before RRT is represented as a relative risk (RR) compared to Quartile 1.

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Age (years)	<65	65-75	75-85	>85
RR	1	1.50	2.33	3.42
GFR (ml/min)	<25	25-35	35-50	>50
RR	1	1.36	1.41	2.35
Log uPCR (mg/mmol) (uPCR)	>5 (>150)	4-5 (55-150)	3-4 (20-55)	<3 (<20)
RR	1	1.57	1.39	1.37
BMI (kg/m <sup>2</sup> )	<23	23-27	27-30	>30
RR	1	1.05 <sup>NS</sup>	1.29	1.32
Bicarbonate(mmol/l)	<13	13-17	17-20	>20
RR	1	1.12 <sup>NS</sup>	1.52	1.75
MAP (mmHg)	>108	97-108	88-97	<88
RR	1	1.21 <sup>NS</sup>	1.29	1.27

Results are statistically significant unless indicated otherwise ("NS" in superscript).

**Results 3. Unadjusted Kaplan-Meier survival analysis shown for selected factors in quartiles:** i) age, ii) GFR, iii) BMI and iv) log uPCR. X-axis represents time taken to reach RRT. Quartiles with best survival on K-M curve are therefore indicative of quartiles more likely to die in advance of RRT.



## Conclusion

Patients with CKD who are female, older, with higher baseline renal function and bicarbonate, and lower proteinuria and BP are more likely to die with CKD than require RRT. This may have implications for advance care planning and resource allocation in the nephrology clinic.

