

Analysis of a National Dataset: Single Kidney Transplant Outcomes in Older Recipients

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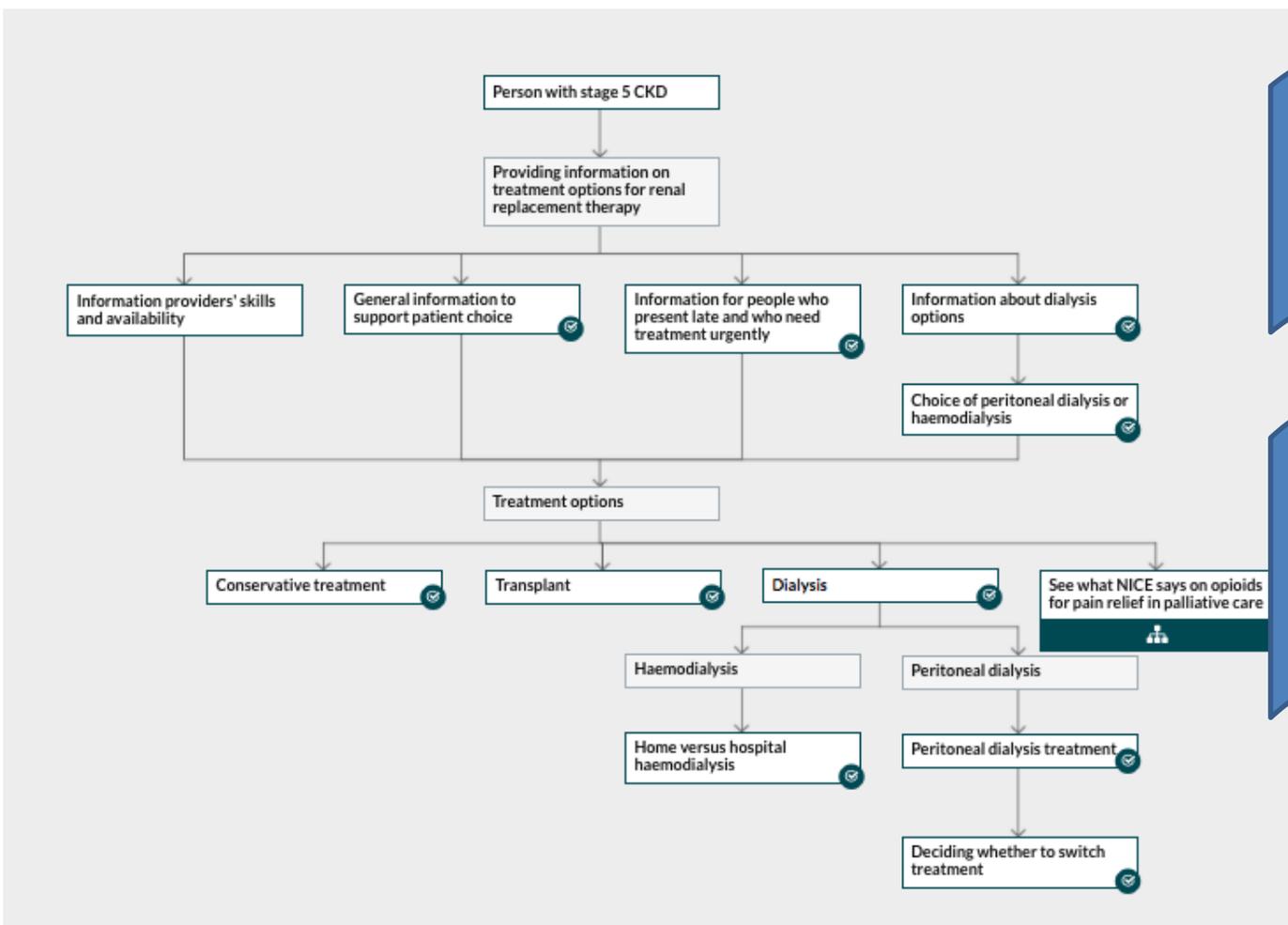


CONFLICT OF INTEREST DISCLOSURE

I have no potential conflict of interest to report

Background

Management of stage 5 chronic kidney disease



CKD care per patient transplant was £12 000

CKD care per patient on dialysis was estimated at £27 000

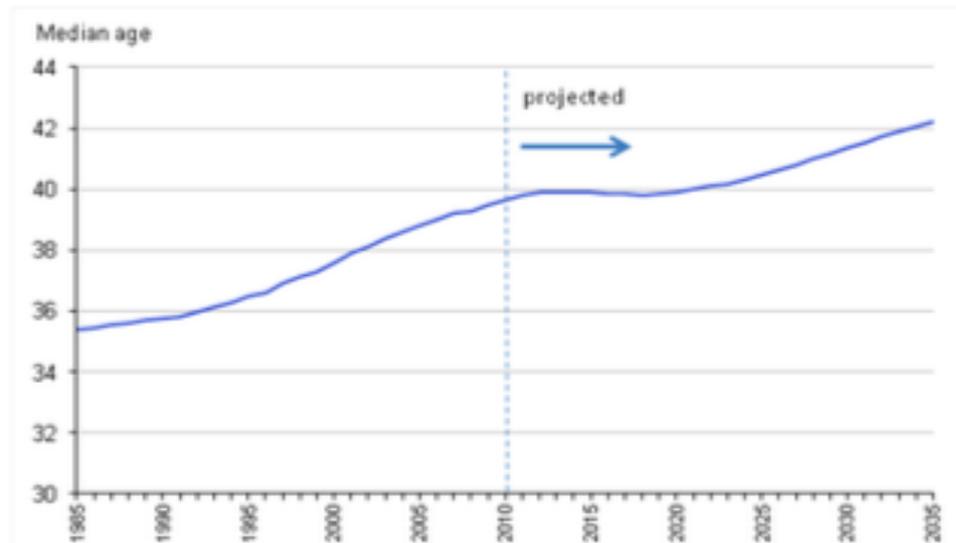
Project Aims

- **Kidney Transplantation Outcomes Stratified by Age: A Contemporary Population Cohort Analysis Using National Registry Data.**
- [?] To analyse transplant outcomes in elderly recipients in the contemporary era of transplantation.
- [?] To aid decision making for the optimal allocation of the finite supply of organs.
- [?] To conduct a subgroup analysis focusing on those over 60 years.

Aging Population

Figure 5: Increasing Age of the UK Population (61)

Median age in the United Kingdom 1985 to 2035



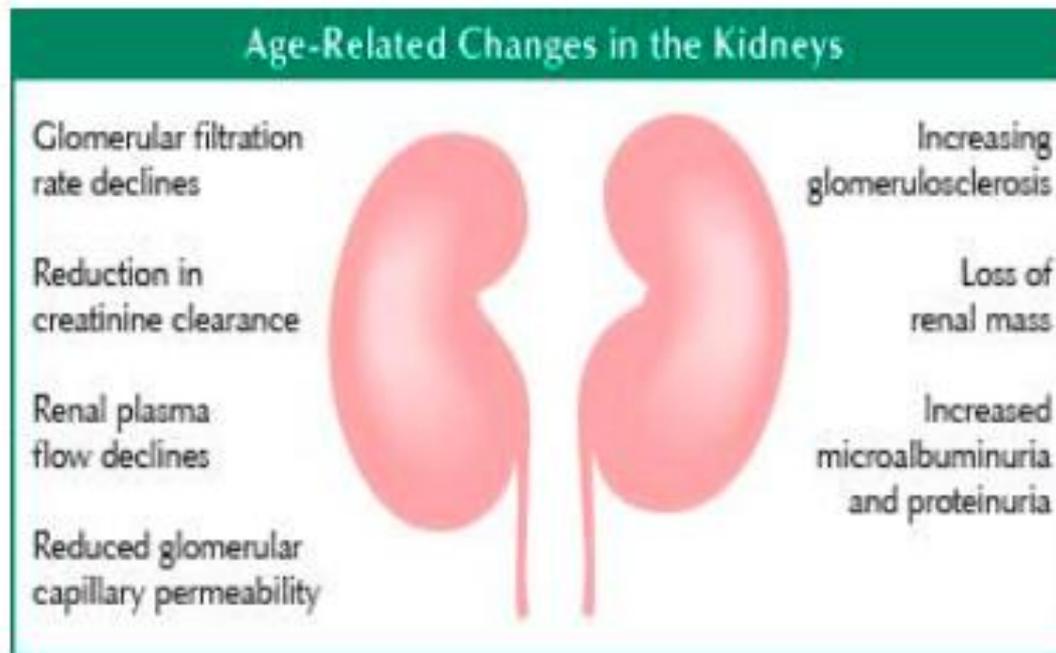
Source: Office for National Statistics, National Records of Scotland, Northern Ireland Statistics and Research Agency

Notes:

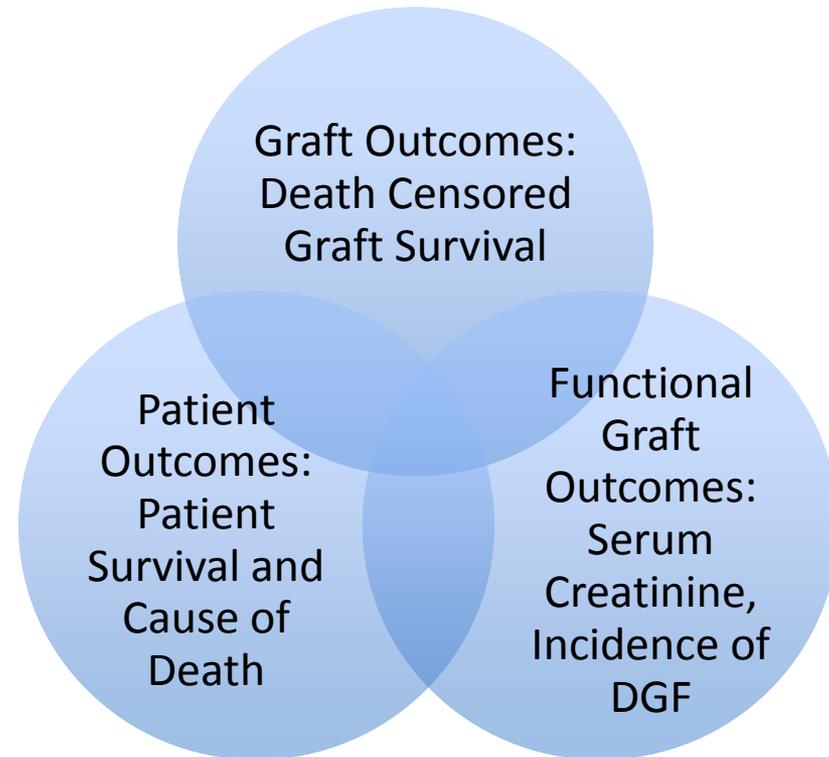
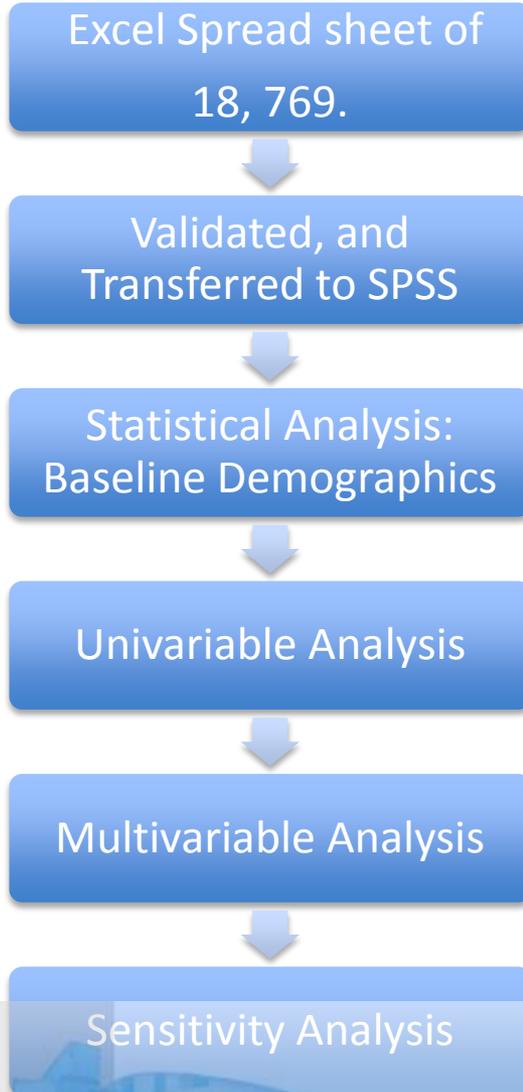
1. 1985 to 2010 Mid-year population estimates, ONS, NRS, NISRA; 2011 to 2035 National Population Projections, (2010-based), ONS.

Aging Kidney

Figure 6: Age Related Changes in the Kidneys (66)



Methods



Results

18,769 Patients

- The groups were categorized by recipient age:
- 18-40years (n=4712), 41-59years (n=8968), and 60+ years (n=5055)
- Subgroup Analysis:
- <59 years, 60-65 years, 66-70 years, 71-75 years , 76+ years.

5, 063 recipients
over 60 years

Results

Figure 15: Patient Survival

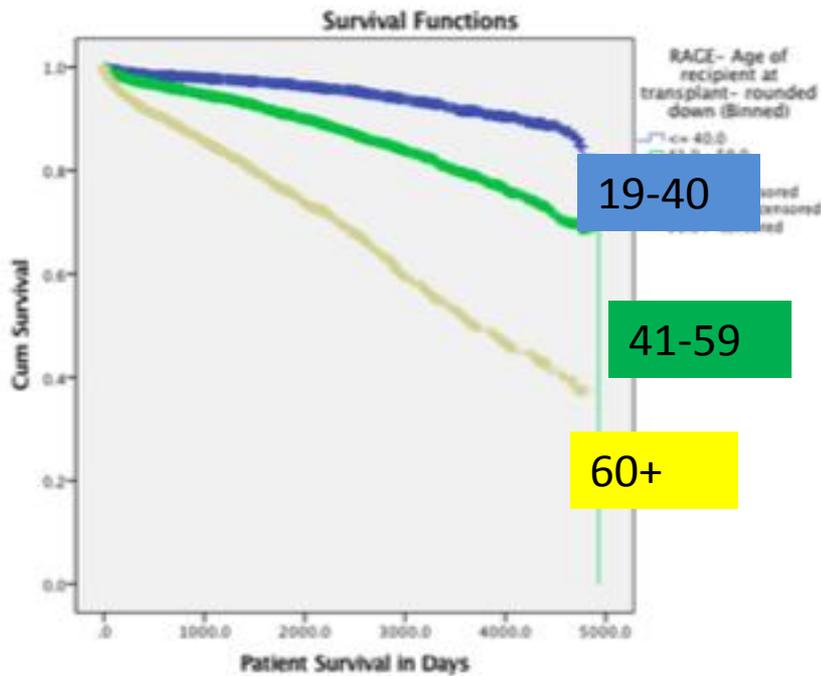
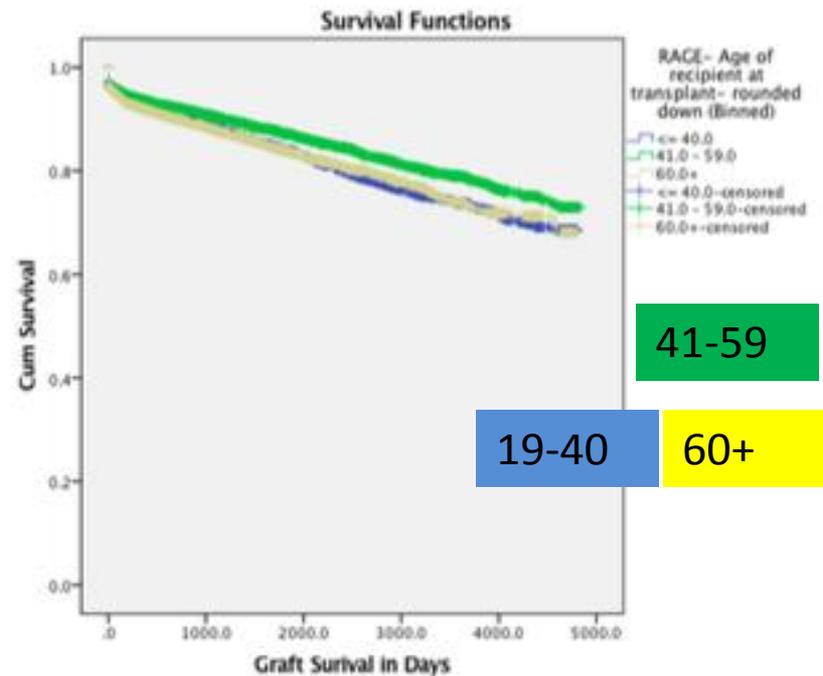


Figure 16: Graft Survival



Results

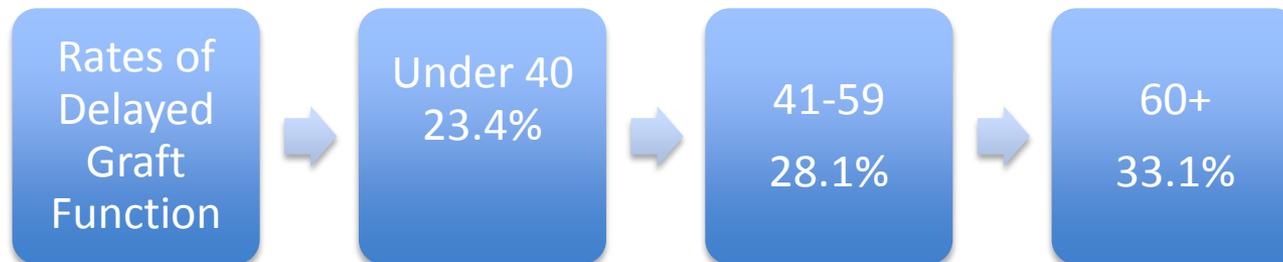
Table 15. Univariable Patient and Graft Survival at 1- 10 years Post -Transplant

Age of Recipient (years)	Patient Survival (years)				Graft Survival (years)			
	1	2	5	10	1	2	5	10
18-40	98.8%	98.2%	96.8%	91.5%	93.5%	91.1%	84.0%	73.6%
41-59	97.2%	95.7%	90.9%	79.1%	93.7%	92.1%	87.2%	78.7%
60+	92.4%	88.7%	76.1%	50.4%	91.9%	89.9%	83.9%	73.6%

Functional Outcomes

Table 18. Serum Creatinine at 3 months and 1 year Post-Transplant

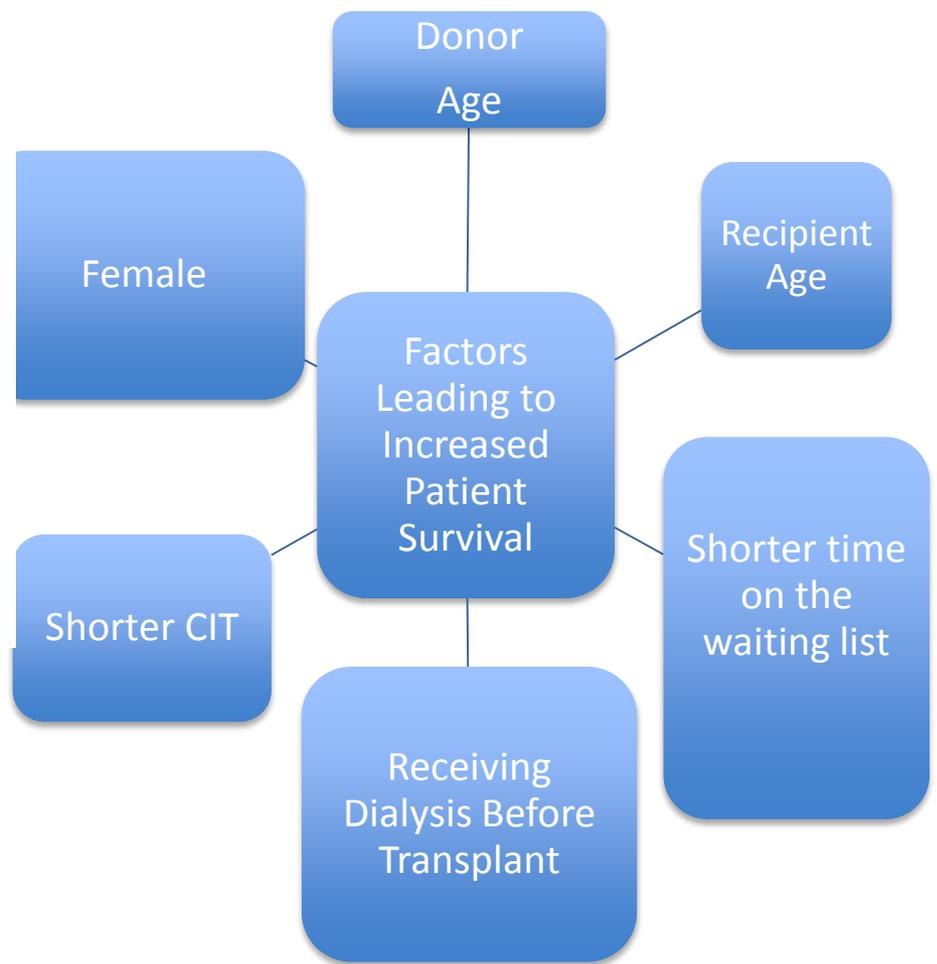
Recipient Age Group	Serum creatinine ($\mu\text{mol/L}$) at 3 months		Serum creatinine ($\mu\text{mol/L}$) at 1 year	
	Median creatinine ($\mu\text{mol/L}$)	95% CI	Median creatinine ($\mu\text{mol/L}$)	95% CI
0-40	130	106-164	127	104-160
41-59	138	111-175	131	106-166
60+	144	112-185	135	107-173



Multivariable Analysis

Table 3 Covariates in Multivariable Analysis

Donor Factors	Recipient Factors	Matching/ Operative Factors
Age	Age	Cold Ischemia Time
Ethnicity	Ethnicity	Length of time on the recipient
Gender	Gender	Sensitisation
BMI	BMI	Antibody Incompatibility
Blood group	Blood group	HLA Mismatch
Diabetes Status	Diabetes Status	Year of Transplant
Hypertension Status	Graft Number	
Smoking Status		



Subgroup Analysis

Figure 18: Patient Survival

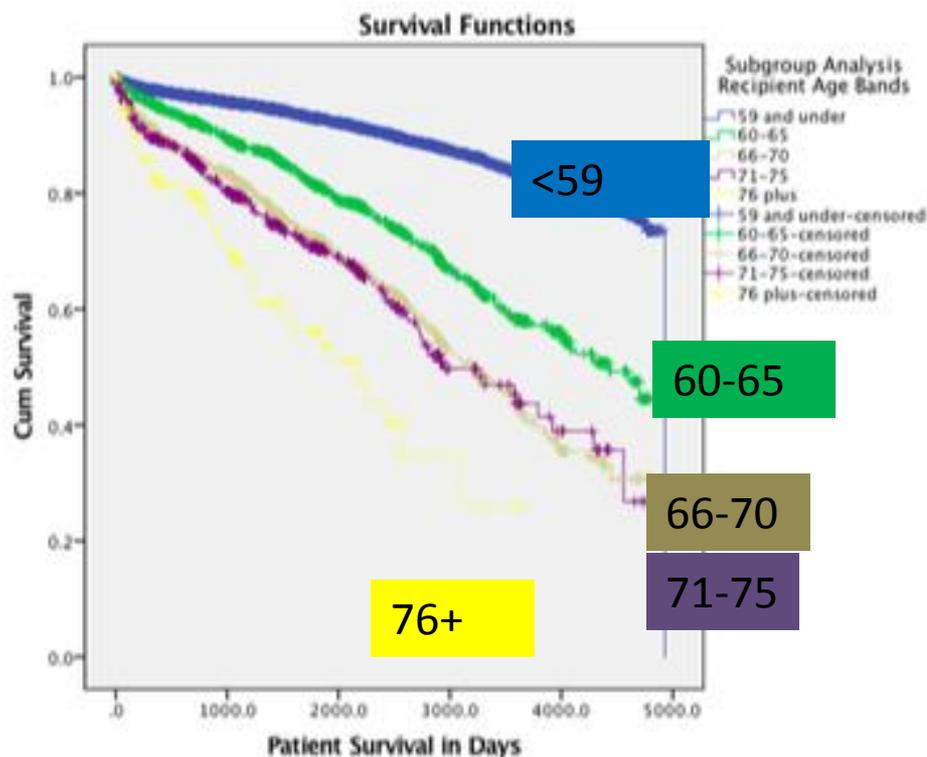
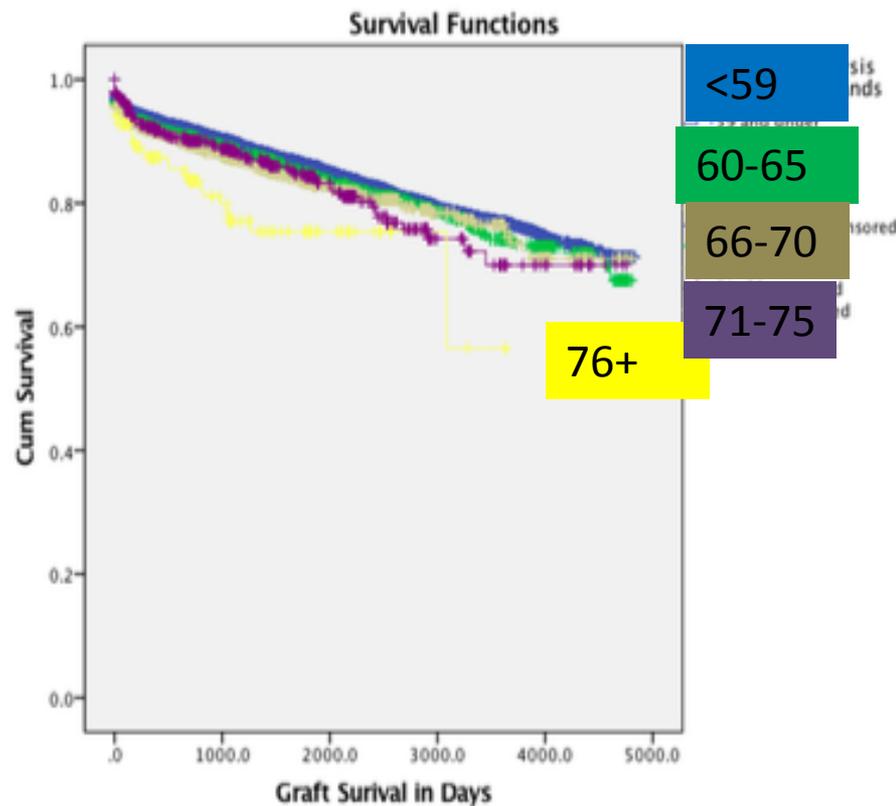


Figure 19: Graft Survival

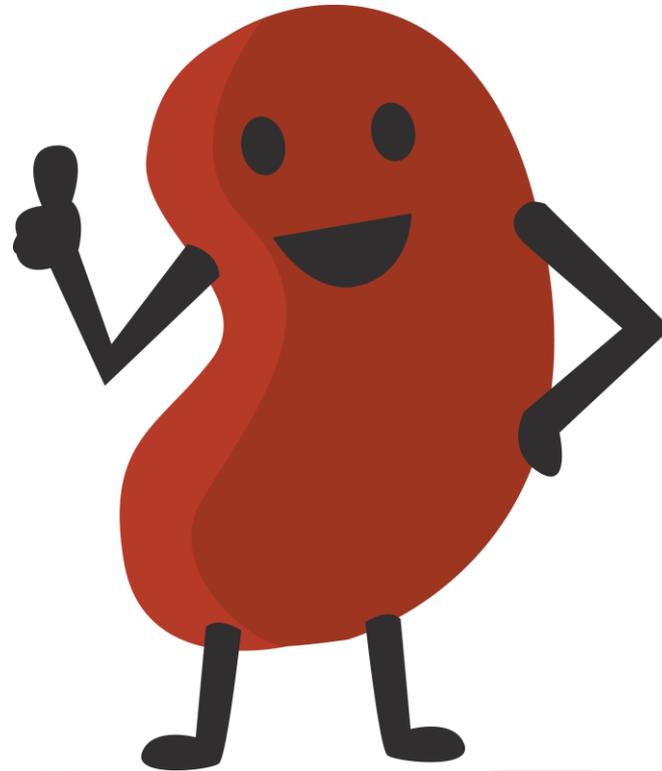


Age Bands: <59, 60-65, 66-70, 71-75, 76>

Conclusion

- Even in the contemporary era, increasing recipient age remains a predictor of inferior clinical outcomes, adding a layer of complexity into the decision of how best to allocate such scarce resources.
- In the literature, there is much heterogeneity in defining at the elderly and therefore we lack clear guidelines on risk of kidney transplantation stratified by recipient age.
- We recommend further research into clinical outcomes among the 60 and over group and consideration should be given for targeted research for age-adapted immunosuppression to optimise outcomes for older kidney transplant recipients.
- Research comparing the outcomes between dialysis and transplantation in a modern UK population is needed.

Thanks for Listening !



References

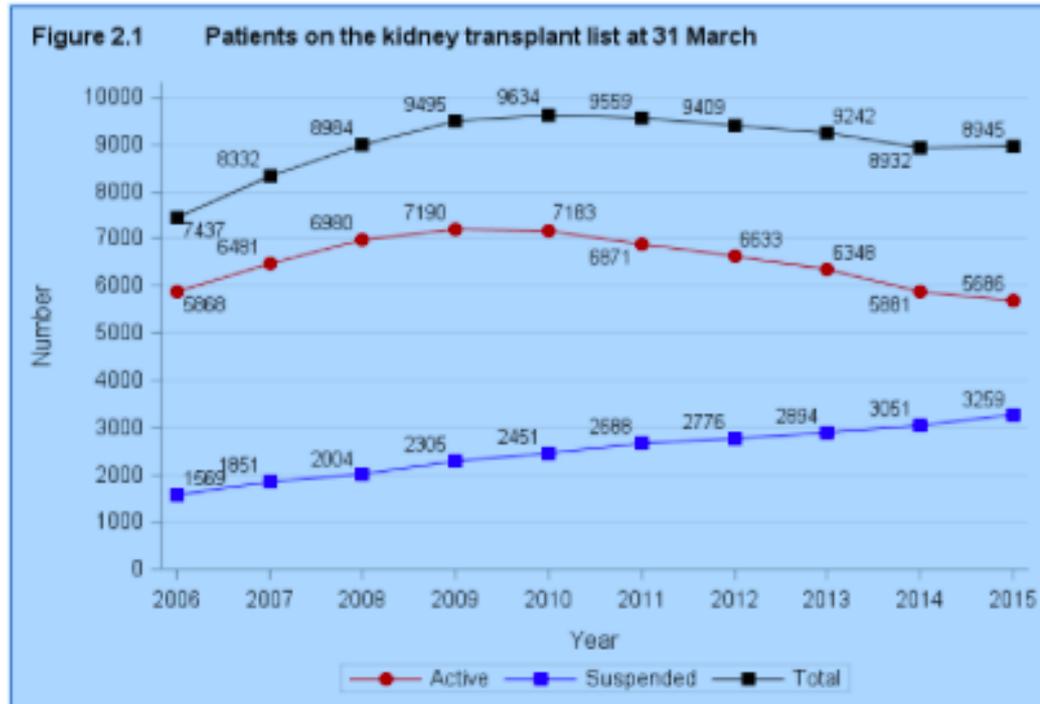
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Future Research

- An application was also made to the UK Renal Registry to collect data on the comparison of survival outcomes following transplantation compared with dialysis
- Unfortunately, this data could not be released due to the Renal Registry undergoing a process of acquiring a new Health Research Authority permission for non-research and research.

Waiting List Mismatch

Figure 2.1 shows the number of patients on the kidney [transplant list](#) at 31 March each year between 2006 and 2015. The number of patients actively waiting for a kidney transplant increased each year from 5,868 in 2006 to 7,190 in 2009 and has since been on the decline falling to 5,686 in 2015.



Extra Info on Stats

- Initial analysis consisted of assessing for areas of high missing data. In both cases it was noted that living transplantations had a disproportionately higher amount of missing data compared to deceased transplantations, therefore both studies excluded living donors.
- Then we undertook the univariable analysis-
- For categorical variables, the mean donor/recipient age was compared using t-tests for factors with two categories (e.g. gender) or one way ANOVA for comparisons across three or more categories (e.g. ethnicity).
- For ordinal and continuous variables, Jonckheere–Terpstra tests was used to identify if there were trends in baseline cohort characteristics across the age groups.
- For the time to event outcomes (i.e. patient and graft survival), Kaplan-Meier curves were produced, with comparisons across the age bands performed using log-rank tests.
- Cox regression models were used to generate hazard ratios for each of the age bands, relative to the reference (i.e. youngest) group.
- Rates of delayed graft function were then compared across the age bands using Chi-square tests
- Kruskal-Wallis tests used to compare creatinine levels at follow up.

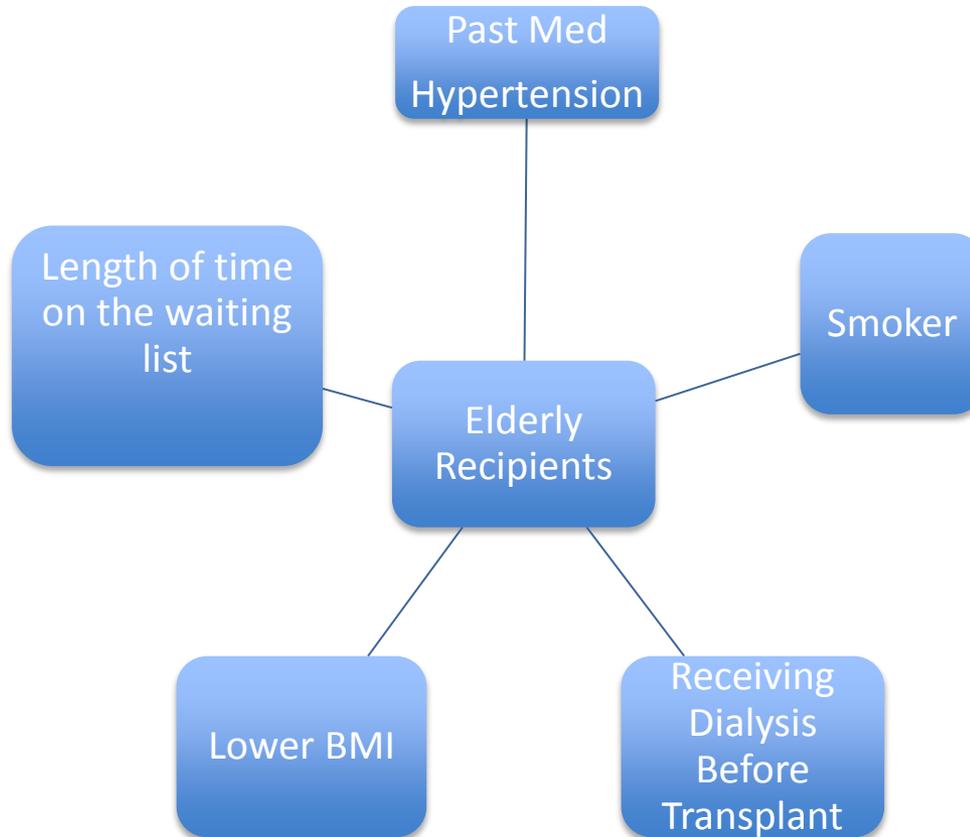
- Multivariable analysis was done to identify confounding factors a table on the next slide shows these
- The stats test used for this was COX proportional hazard regression for graft and patient survival and
- Binary logistic regression for DGF

- And the sensitivity analysis was undertaken to identify if missing data, was missing at random this was done by a 5 step model.

Definitions:

- Recipient survival is defined as the time from transplantation to the death of the patient or the patient's last known follow-up date, at which point the patient was censored. Cause of recipient death was categorized into 5 subgroups, infection, cerebrovascular, cardiovascular, cancer and other.
- The UK Transplant Registry defines graft survival as time from which a recipient was transplanted to the time of graft failure or censor. The censor accounts for patients who died with a functioning graft, or of unrelated causes, particularly relevant in elderly recipients.
- Delayed graft function (DGF) is defined by UK Transplant Registry as the recipient requiring dialysis within one-week of transplantation.

Baseline Characteristics



Elderly Recipients Confounding Factors

Table 16: Patient Survival

Variable	P Value	Hazard Ratio	95.0% Confidence Interval	
			Lower	Upper
Recipient Age (years)				
reference group >60		-	-	-
41-59	<0.001	0.380	0.346	0.417
<40	<0.001	0.156	0.133	0.184
Recipient Gender	<0.001	0.842	0.769	0.920
reference group Male				
Recipient Time on the Waiting List (days)				
reference group <350		-	-	-
351-850	0.459	0.956	0.850	1.076
851-1450	0.130	0.908	0.802	1.029
>1451	0.006	1.179	1.048	1.326
Cold Ischemia Time (minutes)				
reference group <750		-	-	-
751-950	0.411	1.057	0.926	1.206
951-1150	0.351	1.066	0.932	1.219
>1151	<0.001	1.248	1.099	1.418
Age of Donor (years)				
reference group <40		-	-	-
41-50	<0.001	0.616	0.541	0.703
51- 60	<0.001	0.764	0.675	0.865
>61	0.021	0.879	0.787	0.980

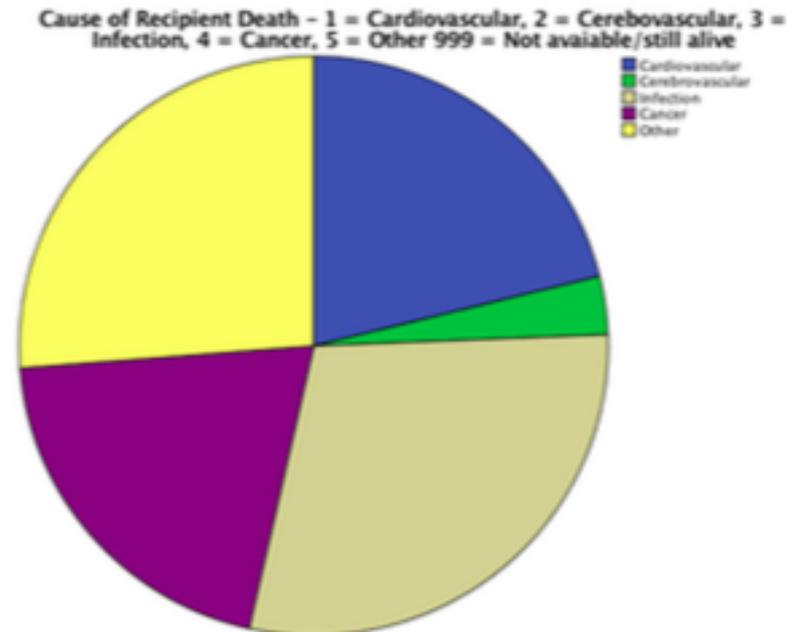
Table 17: Death- Censored Graft Survival

Variable	P Value	Hazard Ratio	95.0% Confidence Interval	
			Lower	Upper
Recipient Age (years)				
reference group >60		-	-	-
41-59	0.021	0.893	0.811	0.983
<40	<0.001	1.273	1.142	1.420
Recipient Ethnicity				
reference group White		-	-	-
Black	<0.001	1.399	1.216	1.610
Asian	0.160	1.084	0.968	1.214
Other	0.636	0.920	0.652	1.299
Graft number	<0.001	1.319	1.193	1.459
reference group those with first graft				
Cold Ischemia Time (minutes)				
reference group <750		-	-	-
751-950	0.013	1.158	1.031	1.301
951-1150	0.028	1.142	1.014	1.286
>1151	<0.001	1.383	1.235	1.548
Recipient Time on the Waiting List (days)				
reference group <350		-	-	-
351 - 850	0.205	1.070	0.964	1.189
851 - 1450	0.817	0.987	0.884	1.102
>1451	0.018	1.137	1.023	1.265
Age of Donor (years)				
reference group <40		-	-	-
41-50	<0.001	0.413	0.368	0.463
51- 60	<0.001	0.585	0.524	0.653
>61	<0.001	0.727	0.658	0.803

Cause of Death

- The most common cause of recipient death was infection, cardiovascular causes then cancer.

Figure 17 Cause of Recipient Death



Subgroup Analysis

Table 19 Subgroup Univariable Survival Analysis.

Graft Survival				
Recipient age(years)	Hazard Ratio	P value	95.0% Confidence Interval	
			Lower	Upper
Reference group 76+	-	<0.001	-	-
<59	0.518	<0.001	0.359	0.747
60-65	0.572	0.004	0.392	0.835
66-70	0.618	0.015	0.420	0.910
71-75	0.613	0.021	0.404	0.929

Patient Survival				
Recipient age(years)	Hazard Ratio	P value	95.0% Confidence Interval	
			Lower	Upper
Reference group 76+	-	<0.001	-	-
<59	0.123	<0.001	0.093	0.163
60-65	0.341	<0.001	0.225	0.455
66-70	0.556	<0.001	0.416	0.744
71-75	0.500	<0.001	0.433	0.806

EuroTransplant Program

The Eurotransplant senior program also found that the major reason for graft loss in older patients was death with a functioning graft.

The results from this study found that graft and patient survival were within the expected range; patient survival was 93% at 1 year and death censored graft survival indicated that allograft survival is good in both the patients between 65-70years and older than 70 (78).

These studies highlight the need for further research into outcomes in elderly age matching between donor and recipients, and transplants in patients over 70 (79).

Supporting Studies

- A study in Spain looking at risk factors for graft loss and mortality according to recipient age showed that the main causes of graft loss were, chronic allograft dysfunction in patients under 40 years, and death with functioning graft in patients aged over 40 years. The patient survival rate differed at 5 years with a survival rate of 97.4% in those under 40 years, compared with 77.7% in patients over 60 years (59).