THE RENAL ASSOCIATION
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Chapter 4

Adults with a kidney transplant (Tx) in the UK at the end of 2019

Contents

Introduction

This chapter describes the population of patients with end-stage kidney disease (ESKD) who had a functioning kidney transplant (Tx) in the UK at the end of 2019 (figure 4.1). Patients can receive their first Tx either pre-emptively, i.e. without spending any time on dialysis, or while on dialysis. Donors in both pathways may be either a living kidney donor (LKD) or a deceased kidney donor – receiving a kidney from a donor after brain death (DBD) or a donor after circulatory death (DCD). If a Tx begins to fail a patient may be considered for a second (or subsequent) Tx, which again can come from a living or deceased donor.

Potential Tx recipients who pass rigorous assessments are wait-listed, which can occur before or after they have started dialysis. The majority of kidneys received through wait-listing are from deceased donors. The cohort of patients living with a kidney Tx in a centre not only reflects differences in underlying population case-mix, but also differences in the rates of acceptance onto renal replacement therapy (RRT).This includes wait-listing rates and live donor programmes, survival of the Tx graft and its recipient, as well as the care and survival of patients on dialysis therapies, as described in other chapters of this report.

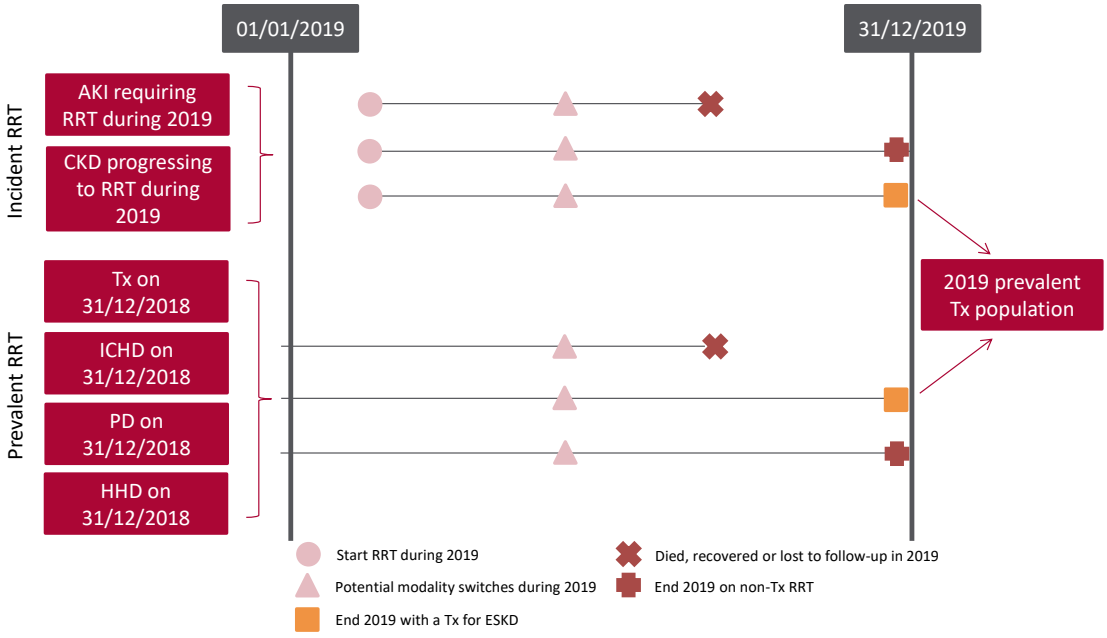

Figure 4.1 Pathways adult patients could follow to be included in the UK 2019 prevalent Tx population

Note that patients receiving dialysis for acute kidney injury (AKI) are only included in this chapter if they had a timeline or RRT modality code for chronic ICHD at the end of 2019 or if they had been on RRT for ≥90 days and were on ICHD at the end of 2019.
AKI – acute kidney injury; CKD – chronic kidney disease; HHD – home haemodialysis; ICHD – in-centre haemodialysis; PD – peritoneal dialysis

Patient survival, graft survival and cause of death analyses were undertaken on historic incident and prevalent cohorts to allow sufficient follow-up time.

The analyses were undertaken using UK Renal Registry (UKRR) data combined with NHS Blood and Transplant (NHSBT) data through a data sharing agreement.

This chapter addresses the following key aspects of the care of patients with a functioning kidney Tx for which there are Renal Association guidelines (table 4.1):

- **Complications associated with CKD and kidney transplantation:** these include anaemia, mineral bone disorders and dyslipidaemia
- **Blood pressure:** attainment of blood pressure targets are reported, although data completeness does not allow differentiation based on levels of proteinuria.

Rationale for analyses

The analyses begin with a brief summary of the number and type of kidney Tx undertaken in recent years in the UK as well as early graft and patient survival. More detailed results are available at organdonation.nhs.uk/helping-you-to-decide/about-organ-donation/statistics-about-organ-donation. The 2019 prevalent adult Tx population is described, including the number transplanted per million population (pmp).

The Renal Association guidelines (renal.org/health-professionals/guidelines/guidelines-commentaries) provide audit measures relevant to the care of patients with a Tx, and where data permit, their attainment by UK renal centres in 2019 is reported in this chapter (table 4.1). Audit measures in guidelines that have been archived are not included.

Some audit measures in current guidelines cannot be reported because the completeness of the required data items is too low. Further detail about the completeness of data returned to the UKRR is available through the UKRR data portal (renal.org/audit-research/data-portal). Audit measures that cannot be reported because the required data items were not collected by the UKRR are omitted. The chapter includes analyses carried out by Getting It Right First Time (GIRFT), a national programme designed to reduce unwarranted variation in medical care provided by the NHS by sharing best practice. The GIRFT metrics for renal services, analysed in collaboration with the UKRR, were based on data derived from multiple sources and included equity of access to services, outcomes and pathways in nephrology, dialysis and transplantation.

Table 4.1 The Renal Association audit measures relevant to Tx that are reported in this chapter

The Renal Association guideline	Audit criteria	Related analysis/analyses
Post-operative care in the kidney Tx recipient (2017)	Proportion of patients receiving a target blood pressure of 140/90 mmHg or 130/80 mmHg in the presence of proteinuria – protein:creatinine ratio >100 mg/mmol or albumin:creatinine ratio >70 mg/mmol	Table 4.8, figures 4.13–4.14 (proteinuria was not adequately collected)
	Proportion of patients achieving dyslipidaemia targets	Table 4.8
	Incidence of hyperparathyroidism	Table 4.8
	Prevalence of anaemia	Table 4.8, figures 4.11–4.12
Anaemia (2017)	Treatment guidelines for anaemia in kidney Tx patients should be similar to those for CKD patients not on dialysis	Table 4.8, figures 4.11–4.12

In 2019, 23 of the 70 adult renal centres in the UK were Tx centres – 19 in England, two in Scotland and one in each of Northern Ireland and Wales.

For definitions and methods relating to this chapter see appendix A. Centres were excluded from caterpillar plots and cells were blanked in tables where data completeness for a biochemical variable was <70% and/or the number of patients reported was <10. The number preceding the centre name in each caterpillar plot indicates the percentage of missing data for that centre.

As Colchester renal centre did not have any Tx patients they were excluded from some of the analyses, although their dialysis patients were included in the relevant dialysis population denominators.

Key findings

- 38,716 adult patients had a kidney Tx for ESKD in the UK on 31/12/2019, which represented 56.8% of the RRT population
- The median age of kidney Tx patients was 55.6 years and 60.8% were male
- There was a 1% increase in overall kidney Tx performed in 2019 compared to 2018, with a decrease in kidney Tx from DBDs (-3%), but an increase in Tx from DCDs (9%). Tx from LKDs have remained the same
- The median eGFR for kidney Tx patients 1 year after transplantation was 56.2 mL/min/1.73m^2 from LKD, 51.9 mL/min/1.73m^2 from DBD and 49.5 mL/min/1.73m^2 from DCD
- 15.7% of kidney Tx patients had eGFR <30 mL/min/1.73m^2
- The median decline in eGFR slope beyond the first year after transplantation was 0.8 mL/min/1.73m^2/year
- There was no cause of death data available for 33.2% of deaths on Tx. For those Tx patients with data, the leading cause of death was malignancy (22.2%), followed by infection (18.7%), which was previously the most common cause of death for these patients.

Analyses

Kidney Tx activity

NHSBT provided the UKRR with summary data on kidney Tx activity (table 4.2). More detailed results are available at organdonation.nhs.uk/helping-you-to-decide/about-organ-donation/statistics-about-organ-donation. The number of patients receiving a pre-emptive Tx is reported by centre in chapter 2.

Table 4.2 Number of kidney and kidney plus other organ Tx (adult and paediatric) in the UK, 2017–2019 calendar years

Organ	2017	2018	2019	% change 2018-2019
Kidney DBD[1]	1,362	1,466	1,417	-3
Kidney DCD[2]	894	940	1024	9
Kidney LKD	1,016	1,036	1,038	0
Kidney and liver	14	18	18	0
Kidney and heart	0	0	1	-
Kidney and pancreas[3]	172	174	157	-10
Kidney and pancreas islets[4]	4	7	7	0
Small bowel (inc kidney)	1	3	4	33
Total kidney Tx	**3,463**	**3,644**	**3,666**	**1**

[1]Includes en bloc kidney Tx (3 in 2017, 6 in 2018 and 5 in 2019) and double kidney Tx (14 in 2017, 14 in 2018 and 18 in 2019).
[2]Includes en bloc kidney Tx (7 in 2017, 8 in 2018 and 3 in 2019) and double kidney Tx (26 in 2017, 15 in 2018 and 24 in 2019).
[3]Includes DCD Tx (48 in 2017, 48 in 2018 and 45 in 2019).
[4]Includes DCD Tx (1 kidney and pancreas islet transplant in 2017 and 3 kidney and pancreas islet transplants in 2018).
DBD – donor after brain death; DCD – donor after circulatory death; LKD – living kidney donor

Variation in the proportion of patients who received an LKD Tx or were on the Tx waiting list within two years of RRT start, is shown for patients incident to RRT in 2017, adjusted by sex, age and primary renal disease (PRD) (figure 4.2). The analysis for LKD transplantation only is shown separately (figure 4.3).

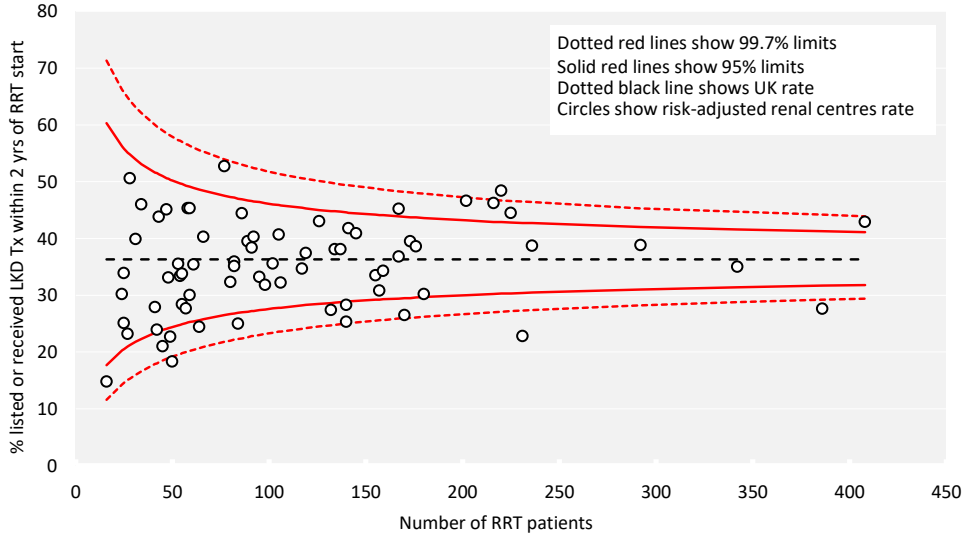

Figure 4.2 Percentage of adult patients incident to RRT in 2017 who were waitlisted or received a living kidney donor (LKD) Tx within 2 years of RRT start adjusted by age, sex and primary renal disease by centre

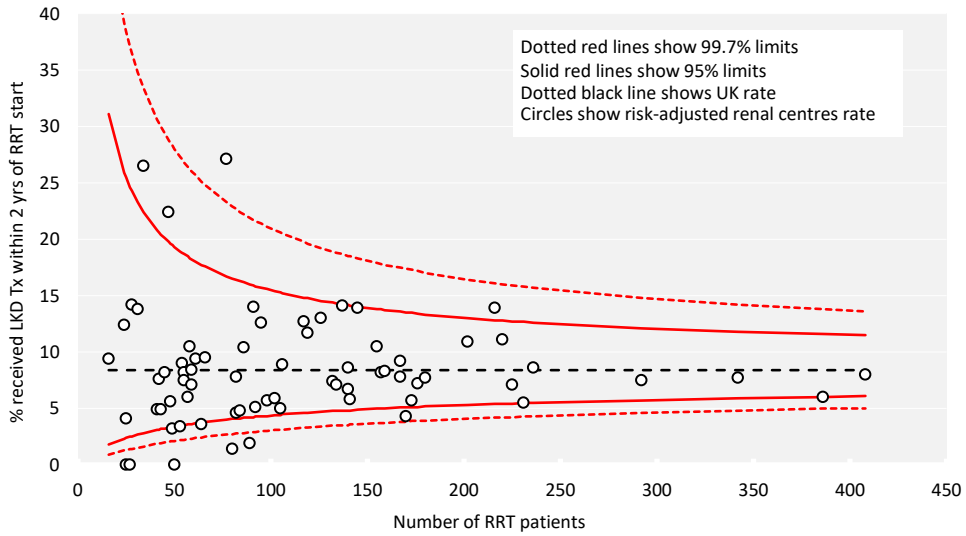

Figure 4.3 Percentage of adult patients incident to RRT in 2017 who received a living kidney donor (LKD) Tx within 2 years of RRT start adjusted by age, sex and primary renal disease by centre

Early kidney Tx outcomes

Kidney Tx recipient outcome data from NHSBT were reported against the Tx centre rather than the referring centre (table 4.3). Note that the survival rates were risk-adjusted and used financial year cohorts as per NHSBT methodology (see table footnote).

Table 4.3 Risk-adjusted first adult kidney-only Tx, graft and patient survival by Tx type and Tx centre[1] (cohorts detailed in footnote)

	Deceased donor				Living donor			
	Adj 1 yr survival (%)		Adj 5 yr survival (%)		Adj 1 yr survival (%)		Adj 5 yr survival (%)	
Centre	Graft	Patient	Graft	Patient	Graft	Patient	Graft	Patient
Bham	91	97	83	88	99	99	93	92
Belfast	92	98	88	84	98	99	93	95
Bristol	93	95	89	83	99	100	92	92
Camb	97	98	91	89	99	99	95	95
Cardff	96	95	89	86	96	97	91	91
Covnt	90	97	81	82	100	100	93	98
Edin	97	100	86	93	100	100	92	99
Glasgw	93	97	86	84	98	100	89	90
L Barts	92	97	81	80	98	99	88	96
L Guy's	94	97	86	91	98	99	93	93
L Rfree	94	98	85	91	100	100	94	98
L St.G	93	97	88	94	99	100	95	97
L West	95	97	86	88	96	97	90	93
Leeds	93	97	87	89	98	100	89	94
Leic	96	96	87	94	98	99	91	92
Liv Roy	95	97	85	80	97	100	93	96
M RI	95	96	90	87	98	99	95	94
Newc	93	94	84	82	99	100	91	96
Nottm	96	96	88	89	96	96	92	91
Oxford	97	98	88	88	98	100	92	94
Plymth	92	95	78	90	97	100	88	94
Ports	95	99	85	84	100	99	96	98
Sheff	92	99	90	85	99	98	95	100
UK total	**94**	**97**	**87**	**87**	**98**	**99**	**92**	**94**

Cohorts for survival rate estimation: 1 year survival: 1/4/2014–31/03/2018; 5 year survival: 1/4/2010–31/3/2014; first grafts only – re-grafts excluded for patient survival estimation. Since the cohorts to estimate 1 and 5 year survival are different, some centres may appear to have 5 year survival better than 1 year survival.

[1]Information courtesy of NHSBT: number of Tx, patients and 95% confidence intervals (CI) for each estimate; statistical methodology for computing risk-adjusted estimates can be obtained from NHSBT (nhsbtdbe.blob.core.windows.net/umbraco-assets-corp/17289/kidney-annual-report-2018-19-november19.pdf).

Kidney graft function at one year post-Tx was assessed using median eGFR by donor type and by centre using a seven year cohort (patients with graft failure including death with a functioning graft were excluded). The data completeness at one year after Tx (for Tx occurring 2012–2018) was 97.1%.

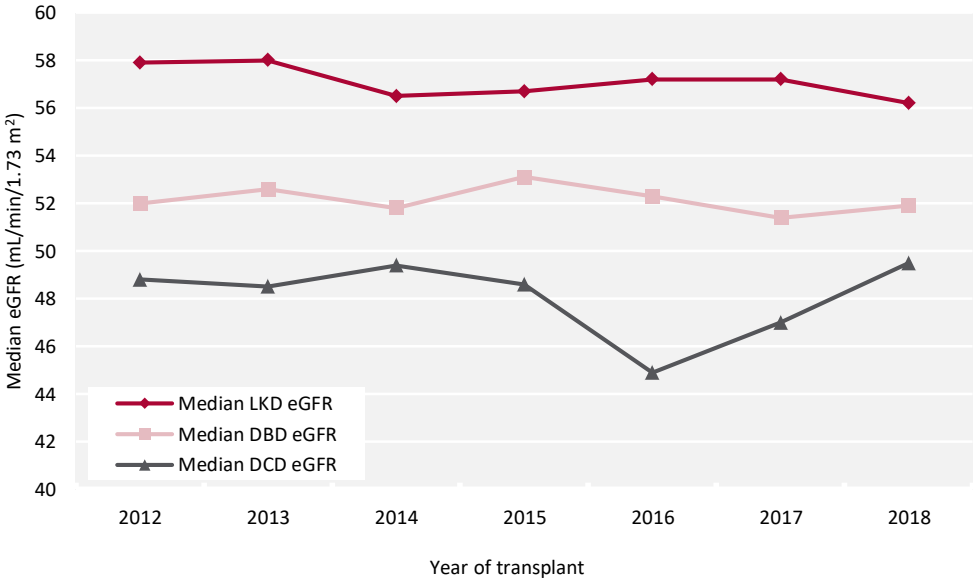

Figure 4.4 Median estimated glomerular filtration rate (eGFR) for kidney Tx at 1 year by donor type and year of transplantation between 2012 and 2018

DBD – donor after brain death; DCD – donor after circulatory death; LKD – living kidney donor

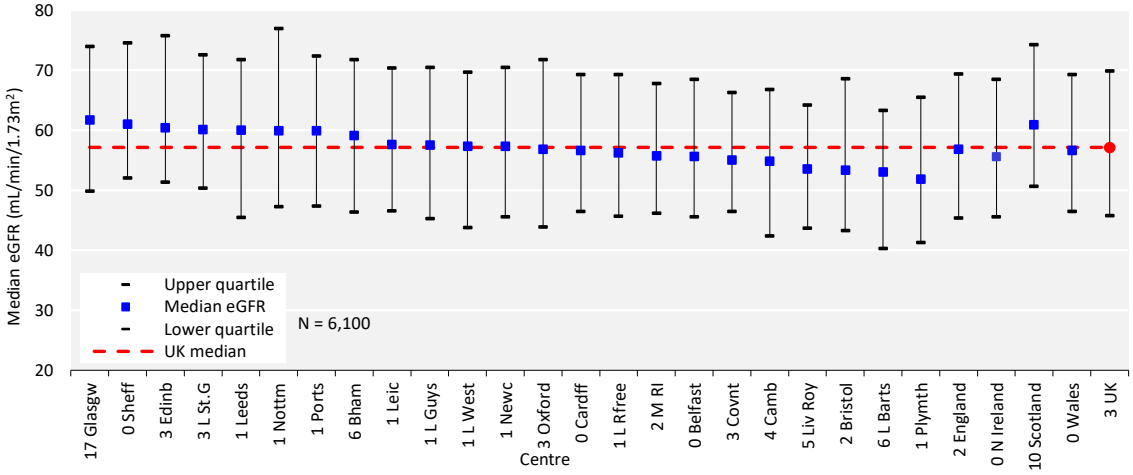

Figure 4.5 Median estimated glomerular filtration rate (eGFR) at 1 year post-living kidney donor (LKD) Tx by transplanting centre and year of transplantation between 2012 and 2018

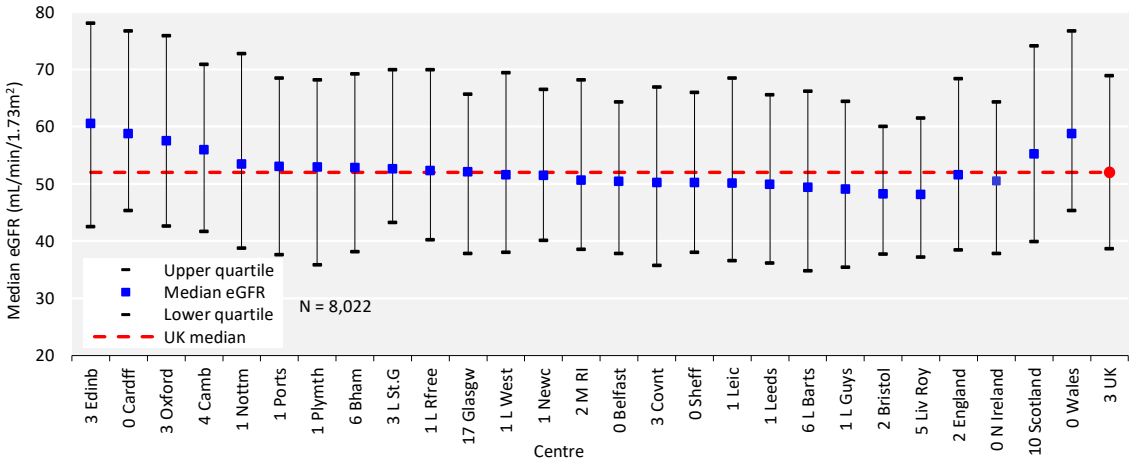

Figure 4.6 Median estimated glomerular filtration rate (eGFR) at 1 year post-donor after brain death (DBD) Tx by transplanting centre and by year of transplantation between 2012 and 2018

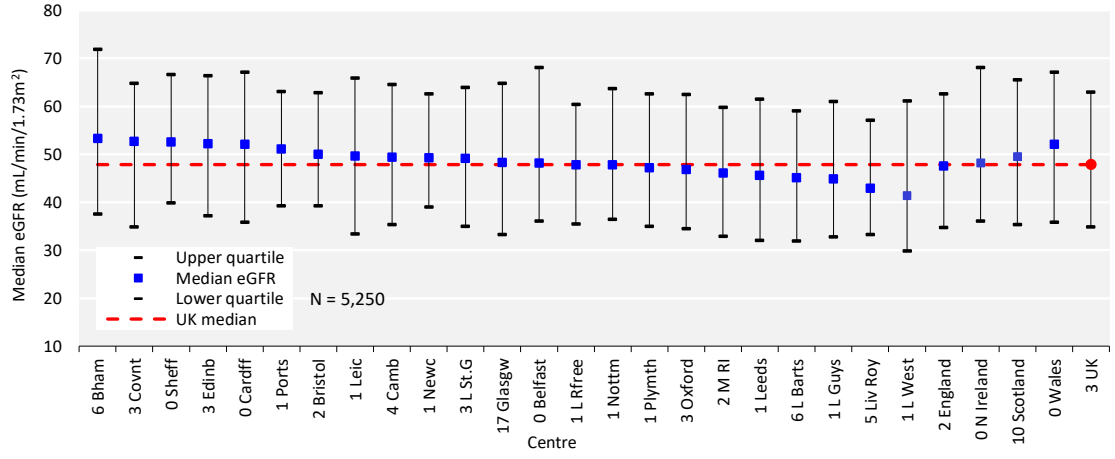

Figure 4.7 Median estimated glomerular filtration rate (eGFR) at 1 year post-donor after circulatory death (DCD) Tx by transplanting centre and by year of transplantation between 2012 and 2018

Changes to the prevalent adult kidney Tx population

Tx recipients are under the care of a Tx centre around the time of transplantation, but the policy of when to repatriate to the referring centre varies. When data entries for patients were received from more than one centre they were attributed to the referring centre.

Table 4.4 Percentage completeness of estimated glomerular filtration rate (eGFR), blood pressure, haemoglobin, total cholesterol, adjusted calcium, phosphate and parathyroid hormone (PTH) by centre for adult patients prevalent to Tx on 31/12/2019

		Data completeness (%)						
Centre	N with Tx	eGFR	Blood pressure	Haemoglobin	Total cholesterol	Adjusted calcium	Phosphate	PTH
TX CENTRES								
Bham	1,582	93.2	84.0	93.2	86.4	92.9	91.5	2.6
Belfast	676	99.3	96.2	98.5	99.6	98.7	98.4	31.4
Bristol	911	99.5	82.3	99.3	94.4	99.0	98.6	99.0
Camb	1,066	94.5	0.0	94.3	89.9	93.5	93.4	90.5
Cardff	1,052	98.8	96.6	98.8	83.3	98.0	97.9	27.6
Covnt	601	96.5	85.4	96.3	72.6	95.3	42.4	41.3
Edinb	526	88.4		97.0		89.5	87.8	
Glasgw	1,155	99.3		99.1		98.4	98.4	
L Barts	1,319	98.1	0.5	98.0	98.7	97.9	97.9	98.3
L Guys	1,496	98.7	0.0	98.7	49.0	96.2	96.3	38.8
L Rfree	1,376	98.2	87.5	98.2	59.9	97.2	97.2	68.5
L St.G	488	96.3	85.0	96.3	71.5	95.7	95.7	37.9
L West	1,980	97.0	0.0	97.1	45.2	96.3	97.0	40.1
Leeds	1,055	99.8	95.6	99.5	98.4	97.8	92.6	33.9
Leic	1,397	96.6	11.7	96.5	94.9	95.8	95.4	36.1
Liv Roy	778	96.5	2.2	96.4	54.5	95.4	95.8	0.5
M RI	1,346	95.0	3.3	95.0	52.6	95.0	95.0	44.4
Newc	745	97.7	94.8	97.6	63.6	97.3	96.9	76.9
Nottm	729	98.5	96.2	97.9	64.1	97.5	97.3	86.6
Oxford	1,377	86.0	1.5	86.4	51.3	84.5	84.4	41.7
Plymth	338	96.8	93.8	95.9	56.5	95.3	95.0	38.5
Ports	1,112	94.6	12.6	94.7	55.3	93.7	90.1	30.9
Sheff	814	98.5	96.8	98.4	53.4	98.2	97.2	18.2
DIALYSIS CENTRES								
Abrdn	336	99.4		99.1		97.0	96.4	
Airdrie	287	98.3		98.3		97.9	97.9	
Antrim	134	99.3	72.4	99.3	99.3	95.5	96.3	97.8
Bangor	106	100.0	80.2	98.1	97.2	100.0	100.0	22.6
Basldn	102	92.2	56.9	92.2	81.4	92.2	70.6	21.6
Bradfd	400	98.0	31.5	98.0	78.0	92.5	88.8	56.5
Brightn	523	98.3	26.0	97.9	76.5	97.1	95.6	53.7
Carlis	154	89.0	0.0	89.0	63.0	88.3	85.7	41.6
Carsh	811	84.5	4.7	84.3	42.9	83.0	82.9	27.5
Chelms	115	89.6	89.6	87.8	75.7	86.1	84.4	7.8
Clwyd	104	97.1	36.5	97.1	97.1	95.2	95.2	76.9
D&Gall	84	98.8		98.8		95.2	95.2	
Derby	284	97.5	95.4	97.5	93.0	97.2	95.8	89.4
Donc	129	96.9	91.5	96.9	63.6	96.9	96.9	20.9
Dorset	426	88.5	59.2	87.1	66.9	86.6	72.1	49.1
Dudley	109	96.3	53.2	95.4	82.6	87.2	96.3	0.9
Dundee	252	98.8		98.4		98.0	96.4	

Table 4.4 Continued

Centre	N with Tx	Data completeness (%)						
		eGFR	Blood pressure	Haemoglobin	Total cholesterol	Adjusted calcium	Phosphate	PTH
Exeter	530	97.4	86.0	97.0	90.6	96.4	95.7	73.4
Glouc	254	96.9	76.4	96.9	54.7	89.8	87.0	22.1
Hull	486	97.5	2.9	96.3	37.0	94.7	94.7	22.0
Inverns	168	84.5		89.3		87.5	88.1	
Ipswi	233	97.9	94.0	97.9	72.1	97.4	97.4	57.9
Kent	633	98.6	97.3	98.4	71.6	98.0	97.8	15.2
Klmarnk	174	98.3		98.3		96.6	96.6	
Krkcldy	139	95.0		98.6		98.6	98.6	
L Kings	506	97.8	0.2	97.8	77.9	97.8	97.8	80.6
Liv Ain	27	96.3	7.4	96.3	51.9	96.3	96.3	0.0
Middlbr	532	90.4	8.8	90.2	40.0	89.1	88.7	11.5
Newry	155	99.4	83.9	97.4	100.0	96.8	97.4	98.1
Norwch	443	98.4	4.1	96.6	98.4	94.4	93.5	25.1
Prestn	732	97.1	0.0	96.9	67.9	95.9	94.4	39.1
Redng	468	99.6	95.5	99.6	68.0	98.9	79.3	50.4
Salford	668	98.8	0.0	98.7	77.8	98.4	98.4	0.2
Shrew	140	79.3	14.3	78.6	70.0	78.6	78.6	17.1
Stevng	373	97.9	0.0	99.2	40.2	94.4	92.5	55.0
Sthend	105	98.1	91.4	98.1	51.4	97.1	94.3	24.8
Stoke	426	99.3	0.9	99.3	99.8	98.4	98.4	63.6
Sund	273	96.0	0.0	96.3	61.9	96.0	96.0	96.3
Swanse	346	99.7	98.3	98.8	62.1	99.1	99.1	67.9
Truro	252	99.2	0.4	98.8	92.9	98.0	98.0	89.3
Ulster	77	97.4	96.1	97.4	96.1	96.1	97.4	6.5
West NI	204	94.6	94.6	96.6	99.0	89.2	96.6	88.2
Wirral	174	92.0	1.2	89.7	46.6	81.0	79.9	6.3
Wolve	214	84.6	67.3	80.4	67.3	82.2	12.6	22.9
Wrexm	173	98.8	91.9	99.4	99.4	98.8	98.8	99.4
York	340	98.8	79.4	97.9	79.1	96.8	95.9	24.4
TOTALS								
England	**31,372**	**95.90**	**37.72**	**95.71**	**68.83**	**94.66**	**92.00**	**45.18**
N Ireland	**1,246**	**98.39**	**91.81**	**98.07**	**99.28**	**96.39**	**97.67**	**54.57**
Scotland	**3,121**	**96.28**		**97.98**		**95.93**	**95.48**	
Wales	**1,781**	**98.93**	**91.97**	**98.71**	**82.37**	**98.26**	**98.20**	**44.97**
UK	**37,520**	**96.16**	**38.96**	**96.12**	**64.75**	**95.00**	**92.77**	**41.98**

Blank cells – no data returned by the centre.
Patients who had been on Tx for <3 months were excluded from this analysis, including N with Tx.
Scottish centres were excluded from blood pressure, cholesterol and PTH analyses because data were not provided by the Scottish Renal Registry. UK completeness excludes Scotland for these analyses.
Patients with missing ethnicity were classed as White for the eGFR calculation.

For the 70 adult renal centres, the number of prevalent patients with a Tx was calculated as both a proportion of the prevalent patients on RRT and as a proportion of the estimated centre catchment population (calculated as detailed in appendix A).

Table 4.5 Number of prevalent adult Tx patients and proportion of adult RRT patients with a Tx by year and by centre; number of Tx patients as a proportion of the catchment population

Centre	N with Tx					% with Tx					Estimated catchment population (millions)	2019 crude rate (pmp)
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019		
TX CENTRES												
Belfast	562	593	632	665	701	73.1	73.1	75.6	76.4	78.8	0.53	1,328
Bham	1,279	1,400	1,509	1,566	1,636	44.2	46.1	47.8	48.4	49.5	2.03	805
Bristol	895	907	906	923	938	60.6	61.8	61.6	62.8	63.1	1.21	775
Camb	919	950	972	1,017	1,123	70.5	71.9	73.1	73.4	76.5	0.93	1,211
Cardff	1,036	1,034	1,045	1,071	1,081	64.2	63.6	62.1	62.3	62.5	1.15	944
Covnt	518	528	565	577	620	54.0	54.3	58.6	60.3	57.6	0.79	787
Edinb	458	453	482	522	546	59.6	58.3	58.5	60.6	61.7	0.84	652
Glasgw	1,049	1,105	1,136	1,156	1,216	61.4	63.0	64.1	63.7	65.6	1.37	889
L Barts	1,067	1,138	1,195	1,265	1,376	46.8	48.1	48.0	48.7	51.7	1.57	874
L Guys	1,302	1,366	1,413	1,456	1,547	64.7	65.1	65.4	65.4	67.0	1.00	1,553
L Rfree	1,224	1,287	1,344	1,372	1,422	58.5	59.2	61.3	61.3	60.7	1.32	1,081
L St.G	456	458	479	487	502	54.5	54.8	57.8	58.9	58.9	0.66	763
L West	1,784	1,823	1,894	1,972	2,049	54.2	53.8	54.6	55.5	56.7	1.95	1,053
Leeds	954	977	997	1,051	1,078	62.6	63.0	61.6	62.5	62.6	1.36	793
Leic	1,149	1,242	1,288	1,361	1,442	52.9	54.2	54.7	55.5	55.7	2.07	698
Liv Roy	792	778	788	808	804	63.8	64.1	63.1	63.9	65.5	0.80	1,000
M RI	1,293	1,382	1,396	1,420	1,408	68.8	70.1	68.4	68.8	68.4	1.32	1,066
Newc	647	678	709	732	769	64.1	64.6	63.6	63.5	65.5	0.94	815
Nottm	644	678	720	738	751	57.9	58.8	61.2	61.9	61.7	0.92	816
Oxford	1,164	1,223	1,341	1,400	1,432	68.9	69.3	71.6	72.4	72.7	1.43	1,000
Plymth	332	328	339	360	356	66.0	63.9	62.8	66.9	67.0	0.40	896
Ports	928	979	1,052	1,067	1,134	55.6	57.9	60.2	60.5	60.2	1.73	654
Sheff	728	752	784	819	836	52.6	52.9	54.5	55.3	56.1	1.12	744
DIALYSIS CENTRES												
Abrdn	287	303	311	329	343	54.1	54.6	55.2	57.4	61.5	0.50	688
Airdrie	214	230	257	274	296	50.4	52.4	55.0	56.3	56.5	0.46	648
Antrim	99	112	120	131	139	41.1	44.4	47.1	47.8	49.6	0.24	572
Bangor	83	89	94	99	106	45.6	49.7	48.2	49.0	52.7	0.16	653
Basldn	75	79	99	107	104	27.3	28.9	32.9	33.8	32.3	0.34	305
Bradfd	329	360	375	391	413	56.4	56.6	55.7	56.8	56.3	0.49	849
Brightn	451	472	486	510	542	47.5	47.6	48.1	48.3	51.2	1.07	508
Carlis	162	148	155	161	156	57.7	53.1	55.2	55.0	51.5	0.25	617
Carsh	643	681	721	765	830	40.5	41.2	42.6	43.4	46.9	1.61	515
Chelms	112	107	116	118	116	39.7	39.5	42.0	45.0	44.4	0.37	312
Clwyd	81	89	94	98	104	43.8	50.3	52.2	51.6	50.7	0.18	580
D&Gall	65	71	76	83	87	50.0	54.2	56.3	57.2	58.4	0.12	713
Derby	213	223	233	258	294	39.6	41.1	42.0	44.0	45.1	0.56	529
Donc	97	110	117	120	131	32.1	33.2	35.1	36.1	38.3	0.37	352
Dorset	347	368	394	422	435	51.0	53.6	53.7	55.2	56.4	0.72	602
Dudley	84	94	95	106	111	26.7	27.2	25.8	29.0	30.3	0.34	326
Dundee	216	219	232	254	259	51.6	52.4	53.3	57.1	57.7	0.37	706
Exeter	446	477	513	539	543	46.1	47.1	48.5	49.5	49.8	0.94	575
Glouc	178	186	214	242	267	40.1	39.4	42.1	46.5	50.9	0.51	529
Hull	423	454	459	479	498	49.4	53.2	52.6	54.4	55.1	0.79	628
Inverns	146	154	164	169	171	57.9	59.7	62.6	60.6	60.6	0.22	768
Ipswi	221	232	235	232	237	55.1	55.8	54.0	54.2	55.9	0.31	766
Kent	555	584	594	633	650	53.3	54.4	54.5	56.9	57.0	1.06	614
Klmarnk	137	143	159	166	182	44.2	45.1	47.2	49.0	50.7	0.29	626
Krkcldy	125	132	149	153	143	42.4	44.9	49.0	51.3	48.5	0.27	525

Table 4.5 Continued

Centre	N with Tx					% with Tx					Estimated catchment population (millions)	2019 crude rate (pmp)
	2015	2016	2017	2018	2019	2015	2016	2017	2018	2019		
L Kings	428	434	459	481	524	39.5	39.1	40.0	40.6	42.1	0.92	567
Liv Ain	15	14	14	20	28	6.8	6.2	6.7	9.3	13.3	0.43	65
Middlbr	524	532	536	538	554	58.2	59.8	59.2	57.9	58.4	0.80	693
Newry	115	126	138	151	160	51.1	53.4	57.3	60.4	63.8	0.23	688
Norwch	346	391	418	442	451	48.1	50.8	53.8	56.3	55.8	0.68	660
Prestn	588	601	670	718	743	48.4	49.9	52.8	54.4	55.4	1.22	608
Redng	409	431	447	468	484	52.8	54.6	56.2	57.5	56.3	0.69	700
Salford	478	510	568	620	684	49.1	50.1	51.0	52.8	55.3	1.14	600
Shrew	136	133	137	143	142	36.9	35.3	35.7	33.4	33.2	0.41	349
Stevng	295	337	365	377	385	36.3	38.1	41.3	40.2	39.9	1.10	350
Sthend	103	92	97	104	106	41.9	39.0	38.2	39.5	40.2	0.27	391
Stoke	380	402	408	418	437	48.2	48.7	50.4	51.9	54.4	0.72	603
Sund	220	239	262	275	278	47.9	47.1	48.3	49.4	48.9	0.54	513
Swanse	329	328	334	346	356	43.0	42.4	42.0	41.8	41.0	0.75	474
Truro	231	239	242	249	259	55.8	56.1	57.1	57.0	57.7	0.35	730
Ulster	55	58	66	75	77	32.5	34.9	36.3	39.3	42.3	0.20	383
West NI	158	169	188	202	207	53.9	55.1	60.1	62.0	63.1	0.25	834
Wirral	74	117	156	165	179	26.3	34.7	40.4	41.8	43.6	0.47	385
Wolve	185	185	193	201	215	31.8	32.5	33.1	33.1	36.0	0.54	396
Wrexm	144	155	170	170	175	49.2	50.0	52.8	54.3	56.3	0.21	850
York	301	304	324	338	348	61.4	56.8	58.4	59.6	59.9	0.48	723
TOTALS												
England	**27,124**	**28,410**	**29,793**	**31,031**	**32,367**	**52.9**	**53.7**	**54.6**	**55.4**	**56.3**	**44.33**	**730**
N Ireland	**989**	**1,058**	**1,144**	**1,224**	**1,284**	**58.3**	**59.7**	**62.6**	**64.0**	**66.5**	**1.45**	**884**
Scotland	**2,697**	**2,810**	**2,966**	**3,106**	**3,243**	**55.7**	**56.9**	**58.2**	**59.3**	**60.6**	**4.43**	**732**
Wales	**1,673**	**1,695**	**1,737**	**1,784**	**1,822**	**55.1**	**55.3**	**54.7**	**54.8**	**55.0**	**2.45**	**744**
UK	**32,483**	**33,973**	**35,640**	**37,145**	**38,716**	**53.4**	**54.2**	**55.1**	**55.9**	**56.8**	**52.67**	**735**

Country Tx populations were calculated by summing the Tx patients from centres in each country. Estimated country populations were derived from Office for National Statistics figures. See appendix A for details on estimated catchment population by renal centre.
pmp – per million population

Demographics of prevalent adult kidney Tx patients

The proportion of Tx patients from each ethnic group is shown for patients with ethnicity data – the proportion of centre patients with no ethnicity data is shown separately.

Table 4.6 Demographics of adult patients prevalent to Tx on 31/12/2019 by centre

Centre	N on RRT	N with Tx	% with Tx	Median age (yrs)	% male	Ethnicity				
						% White	% Asian	% Black	% Other	% missing
TX CENTRES										
Belfast	890	701	78.8	55.5	58.5	97.4	1.8	0.7	0.2	2.6
Bham	3,308	1,636	49.5	53.1	58.4	63.1	27.5	7.1	2.3	0.6
Bristol	1,486	938	63.1	55.6	60.5	90.1	4.3	4.0	1.7	0.2
Camb	1,469	1,123	76.4	54.7	62.4	90.8	6.2	1.9	1.1	0.2
Cardff	1,730	1,081	62.5	55.5	63.1	92.9	4.6	0.4	2.0	0.4
Covnt	1,076	620	57.6	55.0	61.9	80.5	15.7	3.9	0.0	0.2
Edinb	885	546	61.7	56.3	63.4					71.6
Glasgw	1,854	1,216	65.6	55.5	59.4					40.6
L Barts	2,660	1,376	51.7	53.8	60.3	39.4	32.4	18.9	9.3	0.2
L Guys	2,310	1,547	67.0	53.0	59.3	66.2	10.2	19.2	4.4	0.8
L Rfree	2,344	1,422	60.7	54.8	58.7	48.2	21.9	19.3	10.6	2.8
L St.G	852	502	58.9	56.9	57.6	48.1	24.9	17.5	9.7	3.0
L West	3,613	2,049	56.7	57.5	63.1	44.1	32.7	14.6	8.5	0.0
Leeds	1,723	1,078	62.6	55.3	60.5	80.7	14.8	3.4	1.1	0.0
Leic	2,587	1,442	55.7	56.6	58.4	73.2	21.4	4.0	1.3	1.5
Liv Roy	1,227	804	65.5	55.0	62.2	92.8	2.7	2.4	2.1	0.3
M RI	2,060	1,408	68.3	54.8	60.4	76.7	15.0	6.6	1.7	1.1
Newc	1,175	769	65.4	56.5	59.6	94.4	4.4	0.7	0.5	0.0
Nottm	1,218	751	61.7	54.5	60.6	84.3	8.0	4.9	2.8	0.0
Oxford	1,969	1,432	72.7	55.5	62.8	81.5	11.8	3.2	3.5	7.8
Plymth	531	356	67.0	58.4	67.1	96.4	1.1	0.3	2.3	0.0
Ports	1,883	1,134	60.2	56.4	59.5	93.5	4.1	0.7	1.7	2.2
Sheff	1,491	836	56.1	55.2	62.1	89.8	5.9	1.8	2.5	0.7
DIALYSIS CENTRES										
Abrdn	558	343	61.5	51.9	57.1					53.6
Airdrie	524	296	56.5	55.2	59.5	96.1	2.1	0.4	1.4	3.7
Antrim	280	139	49.6	55.8	63.3	100.0	0.0	0.0	0.0	0.0
Bangor	201	106	52.7	56.0	61.3	98.1	0.0	1.0	1.0	0.9
Basldn	322	104	32.3	53.0	65.4	87.5	4.8	3.9	3.9	0.0
Bradfd	733	413	56.3	52.3	61.5	54.0	43.3	2.2	0.5	0.0
Brightn	1,059	542	51.2	55.5	62.0	90.0	6.3	2.0	1.7	0.4
Carlis	303	156	51.5	56.2	66.7	98.1	1.9	0.0	0.0	0.0
Carsh	1,771	830	46.9	57.0	63.3	70.8	17.1	8.6	3.5	0.6
Chelms	261	116	44.4	58.1	69.0	88.8	2.6	3.5	5.2	0.0
Colchr	145	0								
Clwyd	205	104	50.7	57.0	60.6	97.1	1.9	0.0	1.0	1.0
D&Gall	149	87	58.4	56.5	60.9	97.2	1.4	0.0	1.4	18.4
Derby	652	294	45.1	56.7	61.9	83.7	10.5	2.7	3.1	0.0
Donc	342	131	38.3	58.4	67.9	95.4	2.3	0.8	1.5	0.0
Dorset	772	435	56.3	59.5	58.2	97.7	0.9	0.2	1.2	0.2
Dudley	366	111	30.3	58.6	67.6	79.3	14.4	3.6	2.7	0.0
Dundee	449	259	57.7	56.0	60.6					54.4
Exeter	1,091	543	49.8	56.3	57.6	98.5	0.6	0.6	0.4	0.0
Glouc	525	267	50.9	58.1	60.7	93.6	3.8	1.1	1.5	0.0
Hull	904	498	55.1	55.1	64.1	97.0	1.4	0.6	1.0	0.2

Table 4.6 Continued

Centre	N on RRT	N with Tx	% with Tx	Median age (yrs)	% male	Ethnicity				
						% White	% Asian	% Black	% Other	% missing
Inverns	282	171	60.6	54.5	57.3	95.0	2.5	2.5	0.0	29.2
Ipswi	424	237	55.9	58.3	64.1	85.1	2.6	2.6	9.8	0.8
Kent	1,140	650	57.0	57.0	58.8	92.5	4.8	0.9	1.9	0.0
Klmarnk	359	182	50.7	56.9	60.4					42.3
Krkcldy	295	143	48.5	57.5	62.2					70.6
L Kings	1,244	524	42.1	57.2	62.4	49.7	15.4	30.1	4.8	0.6
Liv Ain	210	28	13.3	50.9	50.0	100.0	0.0	0.0	0.0	0.0
Middlbr	949	554	58.4	56.4	61.6	95.1	4.3	0.4	0.2	0.0
Newry	251	160	63.7	56.1	54.4	98.1	0.6	0.6	0.6	0.0
Norwch	809	451	55.7	57.5	59.7	96.9	2.0	0.9	0.2	0.0
Prestn	1,341	743	55.4	55.8	61.6	86.3	12.7	0.7	0.4	0.0
Redng	860	484	56.3	57.6	62.2	67.0	25.3	5.7	2.0	6.0
Salford	1,237	684	55.3	55.8	58.9	82.5	14.6	1.9	1.0	0.0
Shrew	428	142	33.2	55.7	61.3	93.7	2.8	2.1	1.4	0.0
Stevng	966	385	39.9	56.0	62.6	69.4	18.9	8.4	3.4	0.8
Sthend	264	106	40.2	54.6	55.7	86.8	7.6	1.9	3.8	0.0
Stoke	803	437	54.4	54.4	62.7	91.0	6.0	1.2	1.9	1.1
Sund	568	278	48.9	56.4	60.8	96.0	2.9	1.1	0.0	0.0
Swanse	868	356	41.0	57.7	61.2	97.2	1.7	0.0	1.1	0.6
Truro	449	259	57.7	56.5	56.4	98.1	0.4	0.0	1.5	0.0
Ulster	182	77	42.3	55.3	54.6	94.8	1.3	3.9	0.0	0.0
West NI	328	207	63.1	53.5	61.8	98.1	1.5	0.5	0.0	0.0
Wirral	411	179	43.6	58.1	63.7	95.5	2.8	1.1	0.6	0.0
Wolve	598	215	36.0	54.4	57.7	70.8	22.6	6.6	0.0	1.4
Wrexm	311	175	56.3	52.7	67.4	96.0	1.7	0.0	2.3	0.0
York	581	348	59.9	56.4	58.9	97.4	1.5	0.0	1.2	0.6
TOTALS										
England	**57,510**	**32,367**	**56.3**	**55.6**	**60.8**	**76.3**	**13.9**	**6.6**	**3.2**	**1.0**
N Ireland	**1,931**	**1,284**	**66.5**	**55.4**	**58.8**	**97.7**	**1.3**	**0.8**	**0.2**	**1.4**
Scotland	**5,355**	**3,243**	**60.6**	**55.3**	**60.0**					**45.2**
Wales	**3,315**	**1,822**	**55.0**	**55.6**	**62.9**	**94.6**	**3.4**	**0.3**	**1.8**	**0.4**
UK	**68,111**	**38,716**	**56.8**	**55.6**	**60.8**	**78.5**	**12.6**	**6.0**	**2.9**	**4.7**

Blank cells – no data returned by the centre or data completeness <70%.
Breakdown by ethnicity is not shown for centres with <70% data completeness, but these centres were included in national averages.

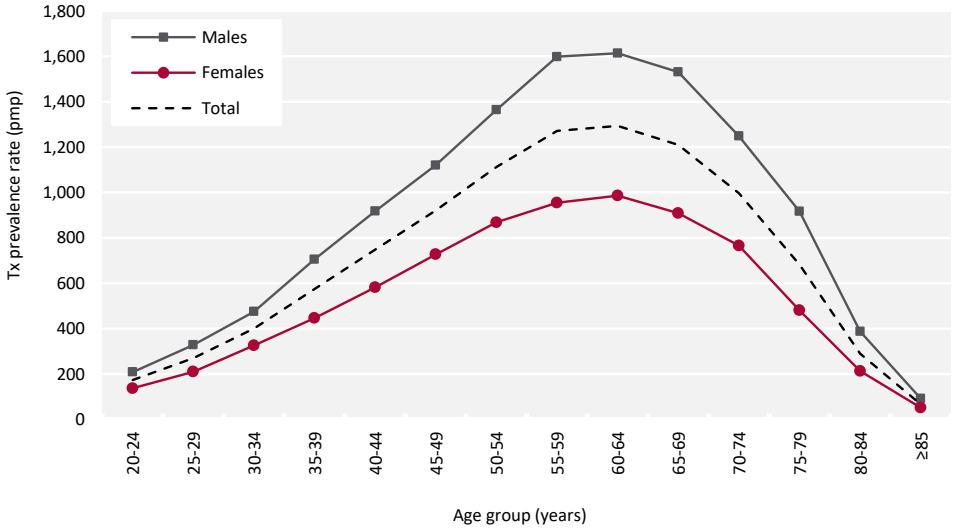

Figure 4.8 Adult Tx prevalence rate on 31/12/2019 by age group and sex
pmp – per million population

The distribution of primary renal diseases (PRDs) as a cause of ESKD in the incident Tx population is compared to the prevalent Tx population (table 4.7). Comparison to dialysis populations is shown in chapter 3. PRDs were grouped into categories, with the mapping of disease codes into groups explained in more detail in appendix A. The proportion of Tx patients with each PRD is shown for patients with PRD data and these total 100% of patients with data. The proportion of patients with no PRD data is shown on a separate line.

Table 4.7 Primary renal diseases (PRDs) of adult patients incident to Tx in 2019 and adult patients prevalent to Tx on 31/12/2019

	Incident Tx		Prevalent Tx	
PRD	N	%	N	%
Diabetes	565	16.7	4,543	11.9
Glomerulonephritis	788	23.3	8,851	23.2
Hypertension	240	7.1	2,049	5.4
Polycystic kidney disease	403	11.9	5,266	13.8
Pyelonephritis	233	6.9	4,287	11.2
Renal vascular disease	59	1.7	437	1.1
Other	638	18.9	7,187	18.9
Uncertain aetiology	456	13.5	5,500	14.4
Total (with data)	**3,382**	**100.0**	**38,120**	100.0
Missing	147	4.2	596	1.5

Graft function and anaemia in prevalent adult kidney Tx patients

Accepting the limitations of interpreting eGFR in the post-Tx population, analyses by centres were divided into the proportion of patients with eGFR greater or less than 30 mL/min/1.73m^2 and the proportion of patients achieving an adequate haemoglobin level (defined as a haemoglobin ≥100 g/L).

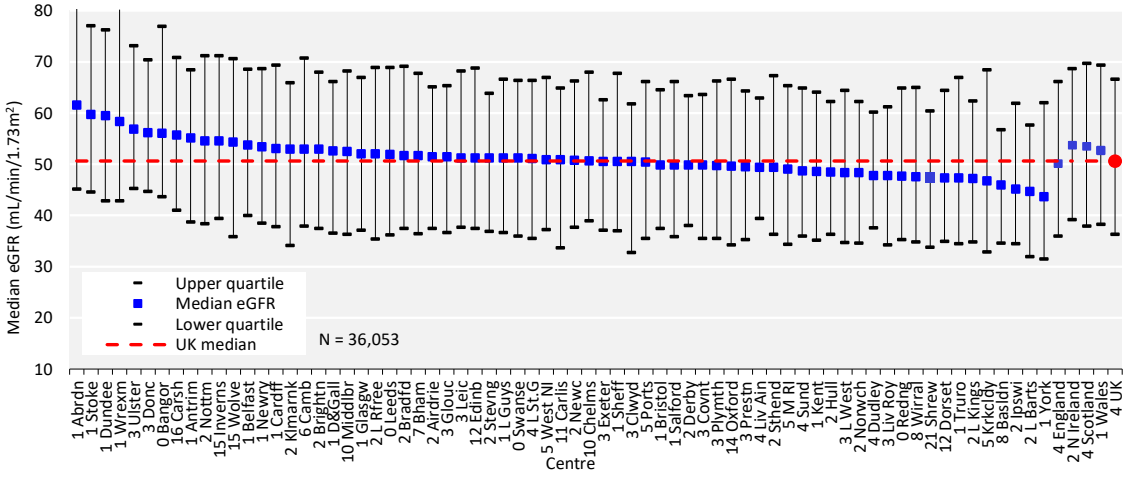

Figure 4.9 Median estimated glomerular filtration rate (eGFR) in adult patients prevalent to Tx on 31/12/2019 by centre

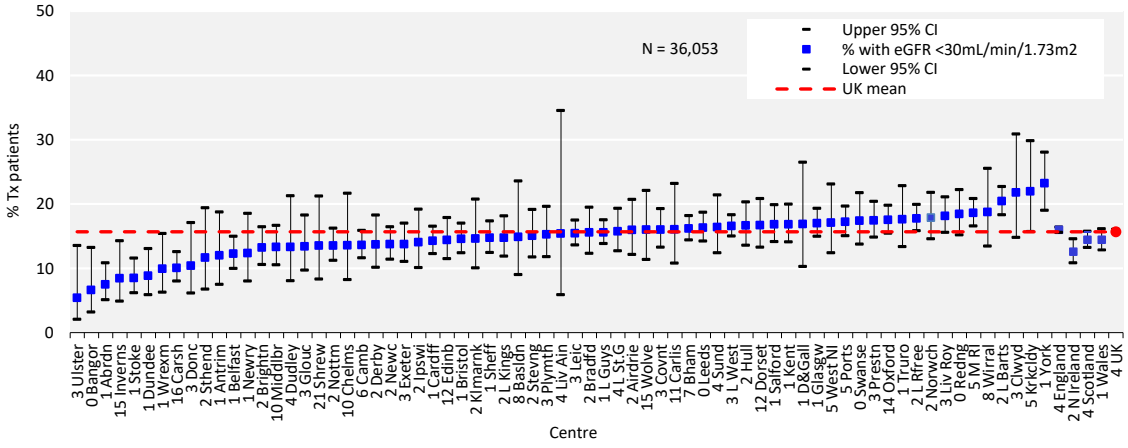

Figure 4.10 Percentage of adult patients prevalent to Tx on 31/12/2019 with an estimated glomerular filtration rate (eGFR) <30mL/min/1.73m^2 by centre
CI – confidence interval

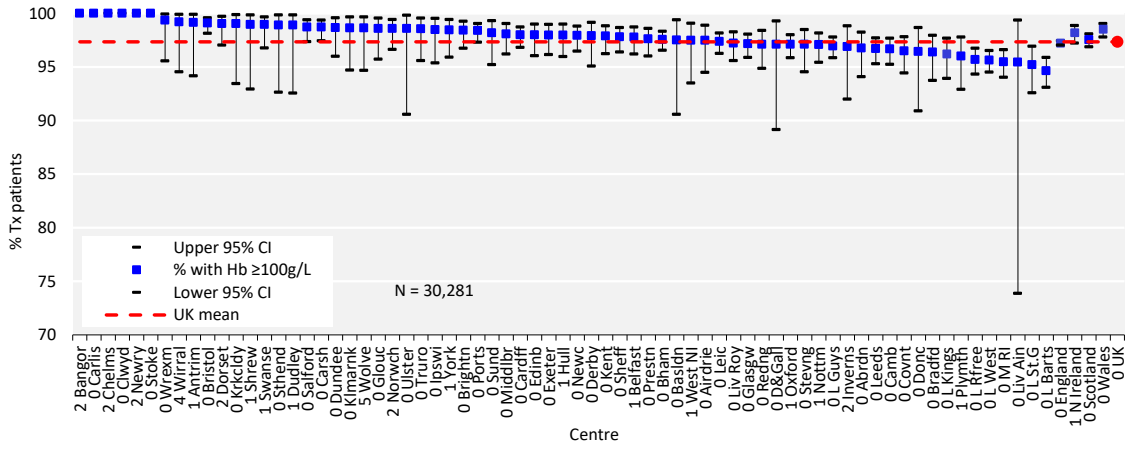

Figure 4.11 Percentage of adult patients prevalent to Tx on 31/12/2019 with an estimated glomerular filtration rate (eGFR) ≥30mL/min/1.73m^2 achieving haemoglobin (Hb) ≥100g/L by centre
CI – confidence interval

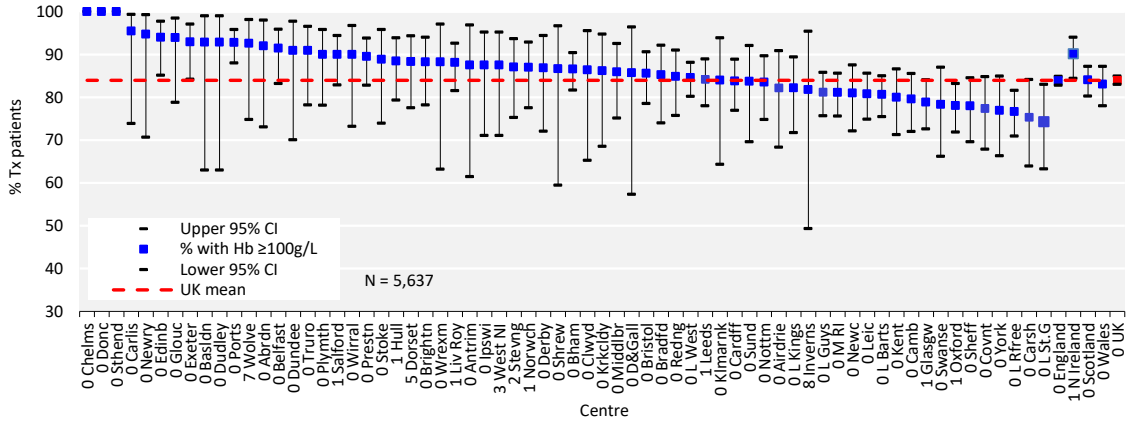

Figure 4.12 Percentage of adult patients prevalent to Tx on 31/12/2019 with an estimated glomerular filtration rate (eGFR) <30mL/min/1.73m^2 achieving haemoglobin (Hb) ≥100g/L by centre
CI – confidence interval

Blood pressure in prevalent adult kidney Tx patients

Blood pressure data completeness was variable (table 4.4) and only centres with ≥70% data completeness were included in the analysis. It is possible that bias may be introduced if blood pressure readings in particular ranges were more frequently reported. A lack of data on proteinuria did not allow differentiation for the purposes of reporting against the audit measure.

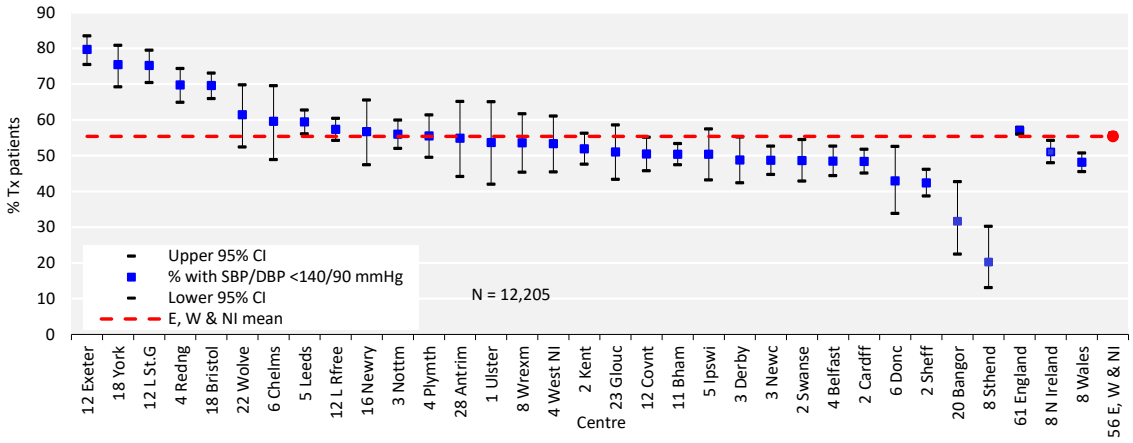

Figure 4.13 Percentage of adult patients prevalent to Tx on 31/12/2019 with estimated glomerular filtration rate (eGFR) ≥30 mL/min/1.73m^2 achieving blood pressure of <140/90 mmHg by centre
CI – confidence interval; DBP – diastolic blood pressure; SBP – systolic blood pressure

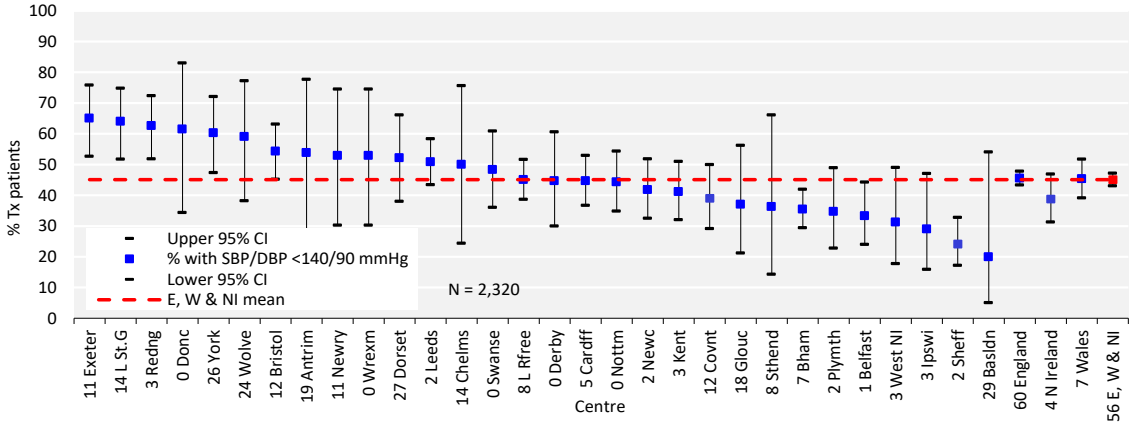

Figure 4.14 Percentage of adult patients prevalent to Tx on 31/12/2019 with estimated glomerular filtration rate (eGFR) <30 mL/min/1.73m^2 achieving blood pressure of <140/90 mmHg by centre
CI – confidence interval; DBP – diastolic blood pressure; SBP – systolic blood pressure

Biochemistry parameters in prevalent adult kidney Tx patients

The attainment of audit standards is shown by stage of Tx renal function in the prevalent Tx population and by comparing to the prevalent dialysis population.

Table 4.8 Estimated glomerular filtration rate (eGFR), blood pressure and biochemical parameters in adult patients prevalent to Tx on 31/12/2019 compared with adult patients prevalent to dialysis on 31/12/2019 by CKD stage

Characteristic	Tx CKD stage (eGFR)				Prevalent dialysis Stage 5D
	Stage 1-2T (≥60 mL/min/1.73 m²)	Stage 3T (30-59 mL/min/1.73 m²)	Stage 4T (15-29 mL/min/1.73 m²)	Stage 5T (<15 mL/min/1.73 m²)	
N	12,346	18,073	4,801	858	22,475
%	34.2	50.1	13.3	2.4	
eGFR (mL/min/1.73m²)					
mean ± SD	76.9 ± 13.5	45.3 ± 8.4	23.6 ± 4.1	11.8 ± 2.4	
median	73.5	45.4	24.2	12.3	
SBP (mmHg)					
mean ± SD	135 ± 17	138 ± 18	141 ± 19	143 ± 20	136 ± 25
% ≥140 mmHg	35.6	42.8	49.7	57.9	41.5
DBP (mmHg)					
mean ± SD	80 ± 11	80 ± 11	80 ± 12	80 ± 14	69 ± 15
% ≥90 mmHg	17.1	18.3	18.9	24.2	9.6
Total cholesterol (mmol/L)					
mean ± SD	4.3 ± 1.1	4.4 ± 1.1	4.5 ± 1.2	4.6 ± 1.3	3.8 ± 1.1
% ≥4.0 mmol/L	63.8	64.4	63.3	70.4	40.2
Haemoglobin (g/L)					
mean ± SD	137 ± 16	129 ± 17	116 ± 16	107 ± 16	110 ± 14
% <100 g/L	1.4	3.5	12.9	33.5	19.8
Phosphate (mmol/L)					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.1 ± 0.2	1.4 ± 0.4	1.7 ± 0.4
% >1.7 mmol/L	0.1	0.2	1.8	19.8	40.4
Adjusted Ca (mmol/L)					
mean ± SD	2.4 ± 0.1	2.4 ± 0.1	2.4 ± 0.2	2.4 ± 0.2	2.4 ± 0.2
% >2.5 mmol/L	26.2	25.8	21.4	14.2	16.2
% <2.2 mmol/L	2.4	3.2	7.0	13.6	15.8
PTH (pmol/L)					
median	8.4	9.8	15.8	27.2	31.6
% >72 pmol/L	0.2	0.6	2.8	13.0	16.7

Scottish centres were excluded from blood pressure, cholesterol and PTH analyses because data were not provided by the Scottish Renal Registry.

Ca – adjusted calcium; DBP – diastolic blood pressure; PTH – parathyroid hormone; SBP – systolic blood pressure; SD – standard deviation

Differences in the median eGFR slope in Tx patients is reported by patient and Tx graft characteristics. All UK patients aged at least 18 years receiving their first kidney Tx between 01/01/2009 and 31/12/2017 were considered for inclusion. A minimum duration of 18 months graft function was required and three or more creatinine measurements from the second year of graft function onwards were used to plot eGFR slope. If a Tx failed, but there were at least three creatinine measurements between one year post-Tx and graft failure, the patient was included, but no creatinine measurements after the quarter preceding the recorded date of Tx failure were analysed.

Table 4.9 Differences in median estimated glomerular filtration rate (eGFR) slope between demographic subgroups of adult patients who received their first kidney Tx between 01/01/2009 and 31/12/2017

Characteristic	N	Median slope	Lower quartile	Upper quartile
Age at Tx (yrs)				
<40	4,875	-1.38	-4.63	0.83
40-55	7,715	-0.64	-2.94	1.18
>55	7,340	-0.66	-3.06	1.10
Ethnicity				
White	14,398	-0.66	-3.06	1.12
Asian	2,583	-1.34	-4.19	0.85
Black	1,361	-1.62	-5.08	0.69
Other	310	-0.95	-4.09	0.97
Sex				
Male	12,290	-0.54	-2.95	1.28
Female	7,640	-1.26	-3.98	0.75
Diabetes				
No Diabetes	16,571	-0.71	-3.19	1.10
Diabetes	3,145	-1.34	-4.22	0.85
Tx donor				
Deceased	13,162	-0.81	-3.42	1.14
Living	6,768	-0.80	-3.21	1.00
Year of Tx				
2009	1,904	-0.93	-2.72	0.33
2010	1,995	-0.87	-2.65	0.51
2011	1,971	-0.78	-3.02	0.67
2012	2,175	-0.97	-3.14	0.63
2013	2,391	-0.97	-3.22	0.77
2014	2,326	-0.70	-3.23	1.13
2015	2,313	-0.60	-3.28	1.59
2016	2,366	-0.60	-3.90	2.38
2017	2,489	-0.45	-5.96	4.01
Status of Tx patients at end of follow-up				
Died	1,715	-1.20	-4.29	1.07
Graft failed	1,662	-6.33	-12.38	-3.32
Re-transplanted	82	-3.70	-7.31	-1.66
Graft functioning	16,553	-0.49	-2.58	1.27
Total	**19,930**	**-0.80**	**-3.35**	**1.09**

Survival of adult kidney Tx patients

Survival of incident and prevalent RRT patients is described in detail in chapters 2 and 3, respectively. Survival of incident Tx patients is reported in table 4.3. NHSBT reports the survival of Tx recipients.

Cause of death in adult kidney Tx patients

Cause of death was analysed in patients prevalent to RRT on 31/12/2018 and followed-up for one year in 2019, with comparisons between Tx and dialysis presented in table 4.10. Work is being undertaken to better understand and code the cause of death in Tx recipients. The proportion of RRT patients with each cause of death is shown for patients with cause of death data and these total 100% of patients with data. The proportion of patients with no cause of death data is shown on a separate line.

Table 4.10 Cause of death in adult patients prevalent to RRT on 31/12/2018 followed-up in 2019 by modality

	All modalities		Dialysis		Tx	
Cause of death	N	%	N	%	N	%
Cardiac disease	780	19.5	665	20.5	115	15.3
Cerebrovascular disease	114	2.9	79	2.4	35	4.6
Infection	732	18.3	591	18.2	141	18.7
Malignancy	351	8.8	184	5.7	167	22.2
Treatment withdrawal	709	17.7	680	21.0	29	3.9
Other	1,003	25.1	801	24.7	202	26.8
Uncertain aetiology	306	7.7	242	7.5	64	8.5
Total (with data)	**3,995**	**100.0**	**3,242**	**100.0**	**753**	**100.0**
Missing	1,760	30.6	1,386	29.9	374	33.2

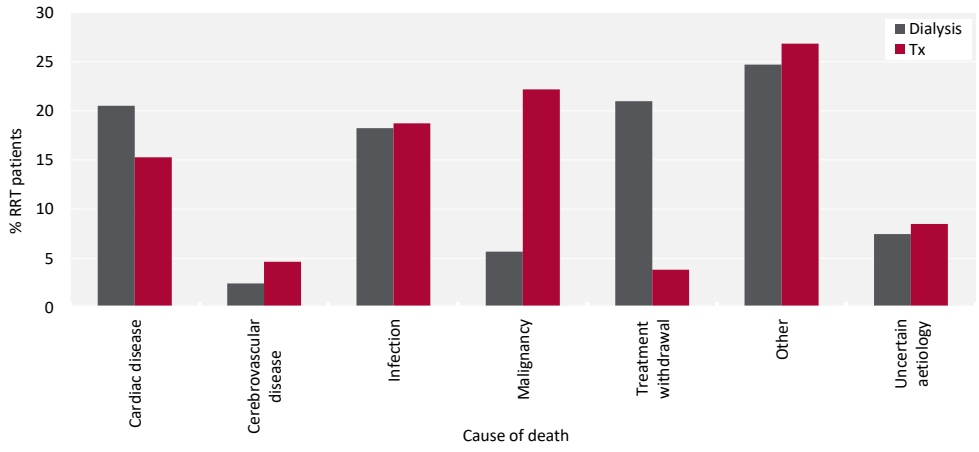

Figure 4.15 Cause of death for adult patients prevalent to RRT on 31/12/2018 followed-up in 2019 by modality

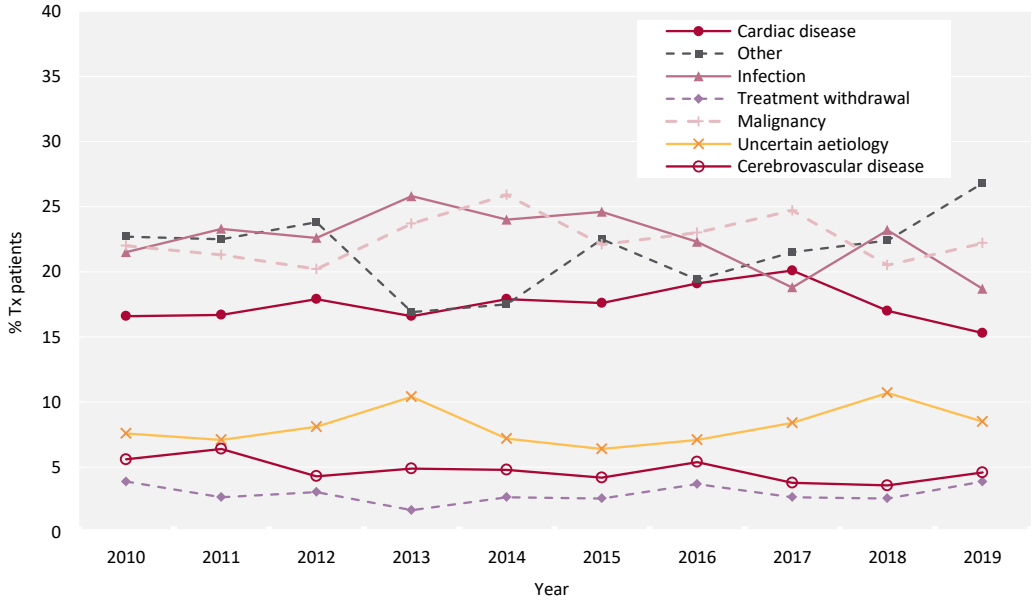

Figure 4.16 Cause of death for adult patients prevalent to RRT on 31/12/2018 followed-up in 2019 by modality

Hospitalisation of Tx patients

Hospital Episodes Statistics (HES) and Patient Episode Database for Wales (PEDW) data for prevalent RRT patients on 31/12/2018 were used to compare emergency admission hospitalisation amongst Tx patients (figure 4.17). The y-axis displays the total number of hospitalised days following an emergency admission for Tx patients divided by the total number of Tx patient-years at that centre for 2019. The average rate in England and Wales was 4.2 days per patient-year, compared to 14.3 days for ICHD patients and 13.2 days for PD patients. HES and PEDW data were also used to calculate the length of stay (LoS) following transplantation in England and Wales. The median LoS for each centre is presented in figure 4.18 and varied from 5 to 11 days. The median for England and Wales was 7 days.

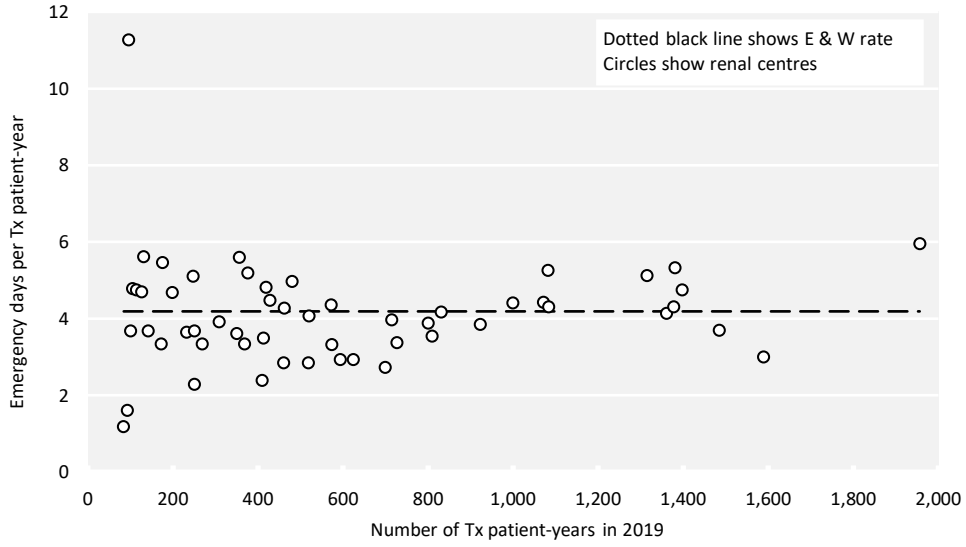

Figure 4.17 Emergency inpatient days per Tx patient-year in 2019 for patients prevalent to RRT in England and Wales on 31/12/2018 by centre

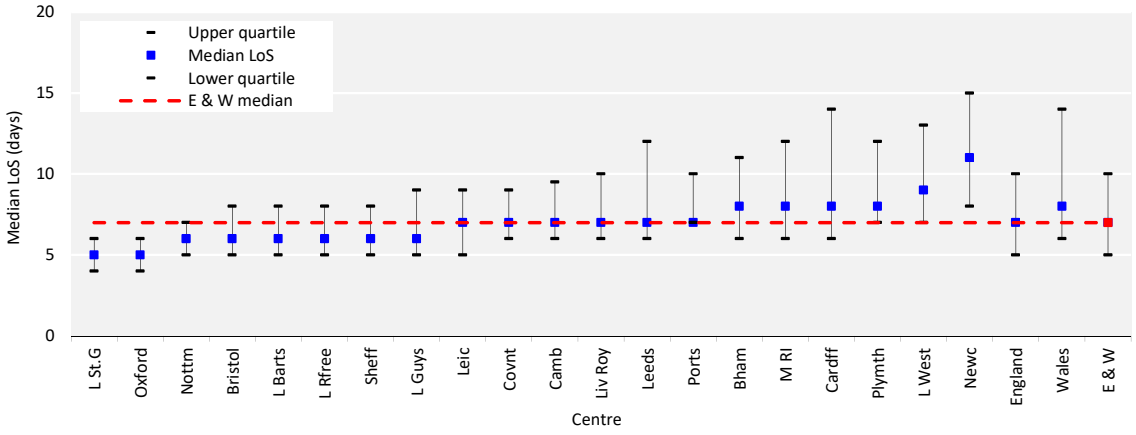

Figure 4.18 Median length of stay (LoS) after transplantation for patients who received a Tx in England and Wales in 2019 by centre