THE RENAL ASSOCIATION
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Chapter 3

Adults with a kidney transplant (Tx) in the UK at the end of 2018

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 2018 (figure 3.1). 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.

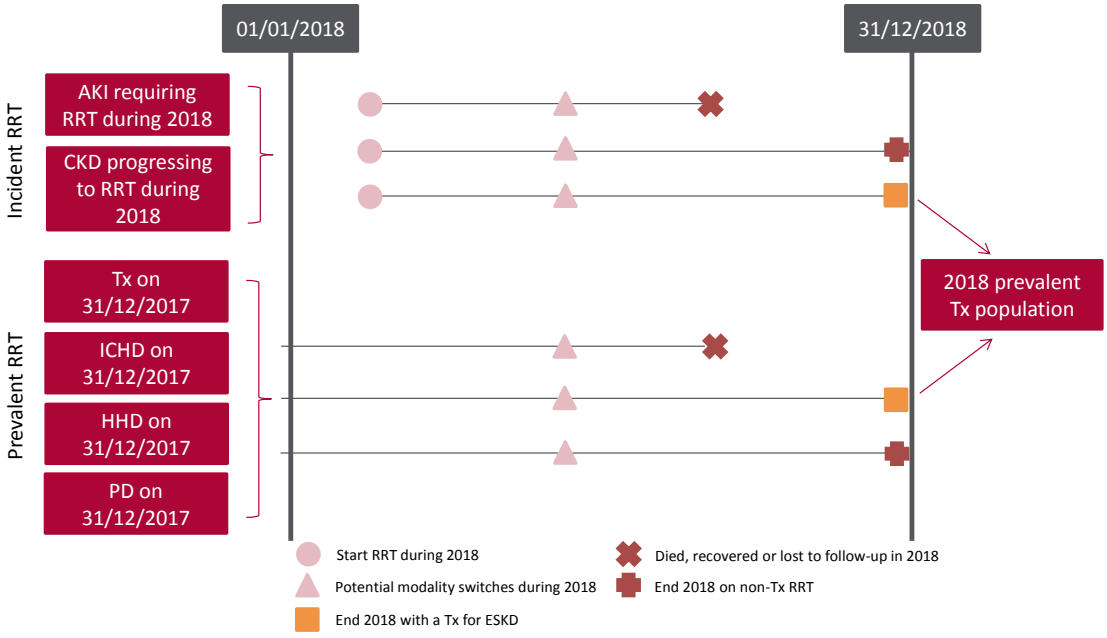

Figure 3.1 Pathways adult patients could follow to be included in the UK 2018 prevalent Tx population

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 2018 or if they had been on RRT for ≥90 days and were on ICHD at the end of 2018.
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 3.1):

- **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/statistics. The 2018 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 2018 is reported in this chapter (table 3.1). Audit measure 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 completeness portal (renal.org/audit-research/data-portal/completeness). Audit measures that cannot be reported because the required data items were not collected by the UKRR are omitted.

Table 3.1 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 3.8, figures 3.11, 3.12 (proteinuria was not adequately collected)
	Proportion of patients achieving dyslipidaemia targets	Table 3.8
	Incidence of hyperparathyroidism	Table 3.8
	Prevalence of anaemia	Table 3.8, figures 3.9, 3.10
Anaemia (2017)	Treatment guidelines for anaemia in kidney Tx patients should be similar to those for CKD patients not on dialysis	Table 3.8, figures 3.9, 3.10

In 2018, 23 of the 71 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.

Cambridge renal centre (Addenbrooke's Hospital), a Tx centre, was unable to submit patient level data for 2017–2018. While data extraction issues have now been resolved, the UKRR and Cambridge are working to load and validate the backlog of data for these years, which should be completed for next year's report. Using aggregate numbers of patients on RRT by treatment modality, it was possible to report treatment rates for Cambridge, but no other quality assurance for the service provided.

Key findings

- 37,302 adult patients had a kidney Tx for ESKD in the UK on 31/12/2018, which represented 55.7% of the RRT population
- The median age of kidney Tx patients was 55.2 years and 60.8% were male
- There was a 5% increase in overall kidney Tx performed in 2018 compared to 2017, with an increase in kidney Tx from DBDs (8%), DCDs (5%) and from LKDs (2%)
- The median eGFR for kidney Tx patients 1 year after transplantation was 57.3 mL/min/1.73m^2 from LKD, 50.9 mL/min/1.73m^2 from DBD and 47.3 mL/min/1.73m^2 from DCD
- 15.9% 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 33.5% of deaths on Tx. For those Tx patients with data, the leading cause of death was infection (23.6%), followed by malignancy (21.0%), 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 3.2). More detailed results are available at organdonation.nhs.uk/statistics. The number of patients receiving a pre-emptive Tx is reported by centre in chapter 1.

Table 3.2 Number of kidney and kidney plus other organ Tx (adult and paediatric) in the UK, 2016–2018 calendar years

Organ	2016	2017	2018	% change 2017-2018
Kidney DBD[1]	1,234	1,362	1,466	8
Kidney DCD[2]	909	894	940	5
Kidney LKD	1,021	1,016	1,036	2
Kidney and liver	18	14	18	29
Kidney and heart[3]	1	0	0	-
Kidney and pancreas[4]	147	172	174	1
Kidney and pancreas islets[3]	0	4	7	75
Small bowel (inc kidney)	1	1	3	200
Total kidney Tx	**3,331**	**3,463**	**3,644**	**5**

[1]Includes en bloc kidney Tx (6 in 2016, 3 in 2017 and 6 in 2018) and double kidney Tx (15 in 2016, 14 in 2017 and 14 in 2018).
[2]Includes en bloc kidney Tx (8 in 2016, 7 in 2017 and 8 in 2018) and double kidney Tx (39 in 2016, 26 in 2017 and 15 in 2018).
[3]Includes DCD Tx (1 kidney and heart transplant in 2016, 1 kidney and pancreas islet transplant in 2017 and 3 kidney and pancreas islet transplants in 2018).
[4]Includes DCD Tx (44 in 2016, 48 in 2017 and 48 in 2018).
DBD – donor after brain death; DCD – donor after circulatory death; LKD – living kidney donor

Early kidney Tx outcomes

Kidney Tx recipient outcome data from NHSBT were reported against the Tx centre rather than the referring centre (table 3.3). Note that the survival rates were risk-adjusted and used financial year cohorts as per NHSBT methodology (see table footnote).

Table 3.3 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
B QEH	92	97	83	91	97	98	94	94
Belfast	92	98	87	85	97	99	95	95
Bristol	95	95	87	84	98	100	95	96
Camb	97	98	90	88	99	99	95	95
Cardff	95	95	90	85	95	96	90	95
Covnt	95	96	76	80	100	100	92	97
Edin	96	99	84	87	100	100	91	97
Glasgw	93	96	91	87	96	100	93	88
L Barts	90	97	82	81	97	100	90	93
L Guy's	94	97	89	92	96	99	94	94
L Rfree	94	98	85	90	99	100	95	96

Table 3.3 Continued

	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
L St.G	93	96	89	95	98	99	93	96
L West	95	97	83	89	96	97	90	93
Leeds	93	97	86	88	97	99	90	96
Leic	95	97	86	92	98	99	90	91
Liv Roy	95	97	89	82	97	99	89	96
M RI	96	96	89	88	97	99	96	94
Newc	94	94	81	81	99	100	93	95
Nottm	97	99	87	87	96	97	92	93
Oxford	96	98	88	88	98	99	93	94
Plymth	93	94	82	92	99	100	87	95
Ports	93	97	83	84	100	99	96	93
Sheff	94	98	89	85	99	98	95	100
UK total	**94**	**97**	**86**	**87**	**98**	**99**	**93**	**94**

Cohorts for survival rate estimation: 1 year survival: 1/4/2013–31/03/2017; 5 year survival: 1/4/2009–31/3/2013; 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/4607/kidney-annual-report-2016-17.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 2011–2017) was 97.0%.

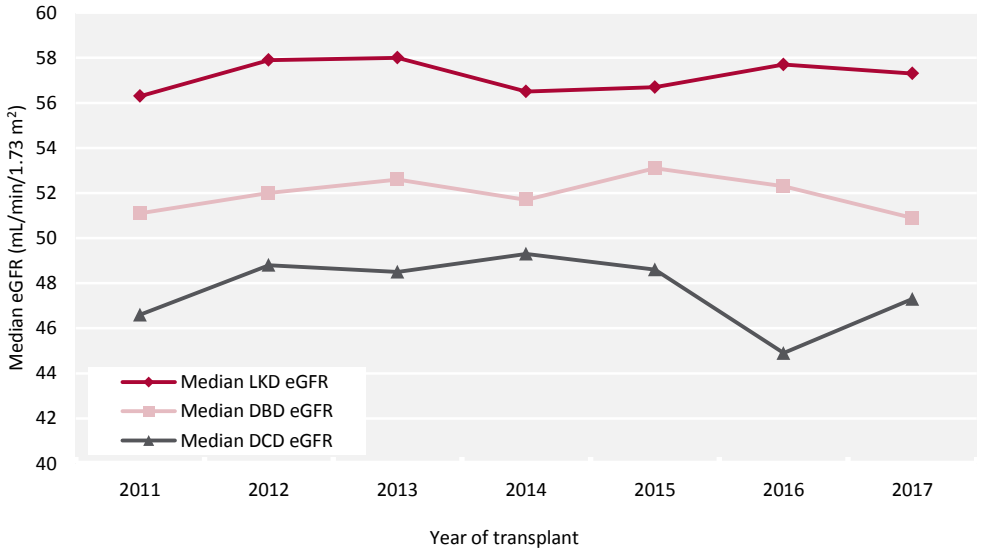

Figure 3.2 Median estimated glomerular filtration rate (eGFR) for kidney Tx at 1 year by donor type and year of transplantation between 2011 and 2017
DBD – donor after brain death; DCD – donor after circulatory death; LKD – living kidney donor

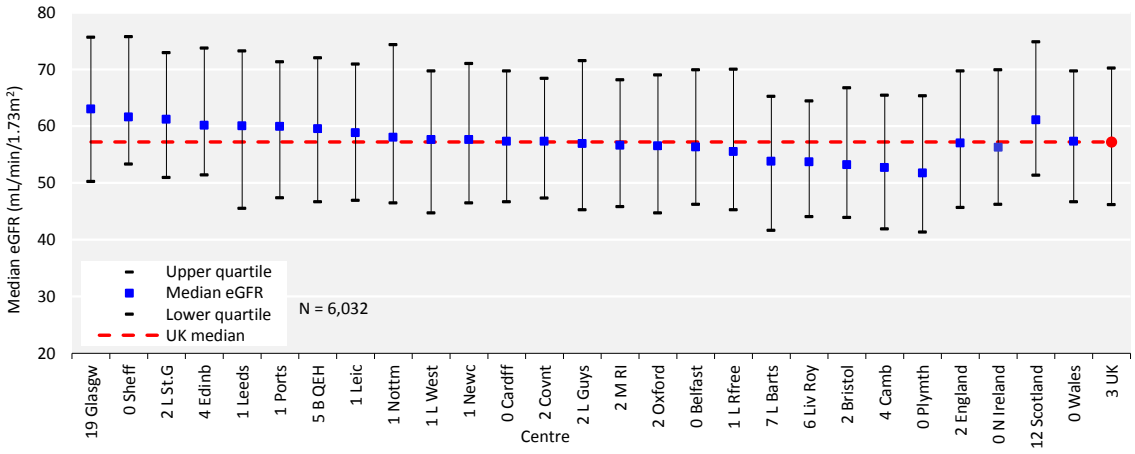

Figure 3.3 Median estimated glomerular filtration rate (eGFR) at 1 year post-living kidney donor (LKD) Tx by transplanting centre and year of transplantation between 2011 and 2017

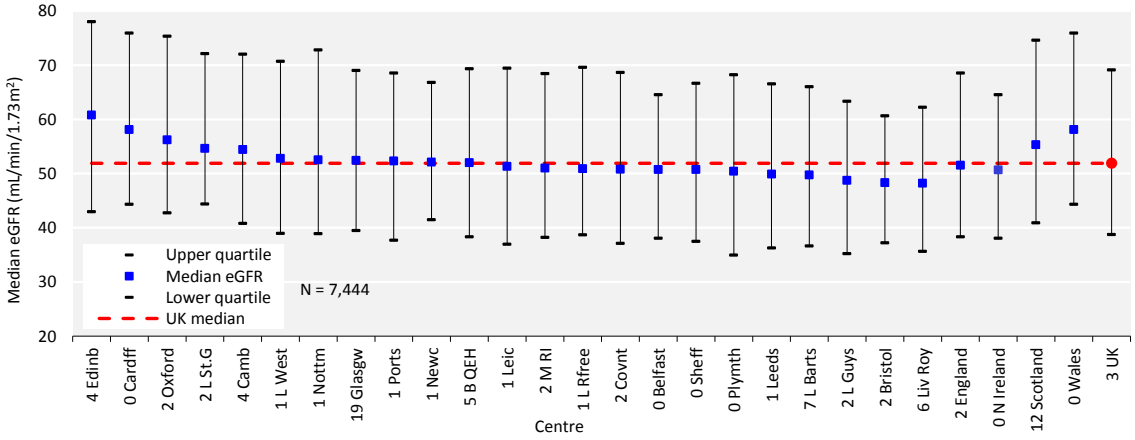

Figure 3.4 Median estimated glomerular filtration rate (eGFR) at 1 year post-donor after brain death (DBD) Tx by transplanting centre and by year of transplantation between 2011 and 2017

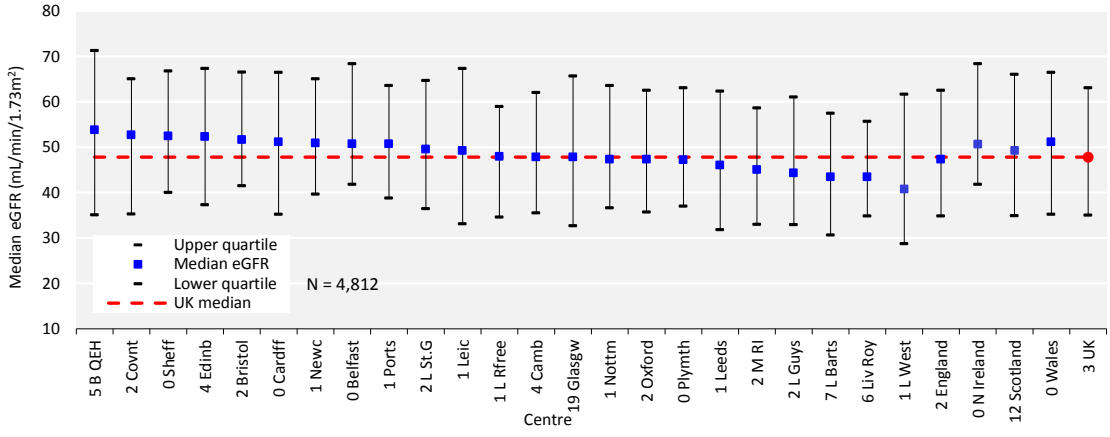

Figure 3.5 Median estimated glomerular filtration rate (eGFR) at 1 year post-donor after circulatory death (DCD) Tx by transplanting centre and by year of transplantation between 2011 and 2017

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 3.4 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 31/12/2018

		Data completeness (%)						
Centre	N with Tx	eGFR	Blood pressure	Haemoglobin	Total cholesterol	Adjusted calcium	Phosphate	PTH
TX CENTRES								
B QEH	1,363	94.4	94.2	94.1	86.9	94.5	93.7	0.0
Belfast	647	99.2	90.9	98.8	99.5	98.9	98.5	33.5
Bristol	907	99.6	79.7	99.3	93.7	98.7	98.4	97.8
Camb								
Cardff	1,041	98.9	94.9	98.8	94.0	98.6	98.6	26.5
Covnt	568	95.1	76.8	94.9	72.4	94.9	56.7	39.3
Edinb	499	74.4		97.0		87.6	86.2	
Glasgw	1,122	99.0		98.7		98.0	98.0	
L Barts	1,215	67.7	0.0	99.0	98.9	99.0	99.0	97.9
L Guys	1,404	98.8	0.0	98.7	46.2	96.2	96.2	37.2
L Rfree	1,342	97.4	85.4	97.1	63.2	93.5	93.6	62.4
L St.G	475	95.6	88.2	95.6	68.8	95.4	95.6	29.9
L West	1,932	96.6	0.0	96.5	56.4	96.1	96.6	43.0
Leeds	1,015	99.1	96.3	98.7	97.1	96.5	92.2	31.9
Leic	1,344	95.9	17.7	95.8	93.8	94.9	94.5	44.2
Liv Roy	787	95.6	1.0	95.2	53.9	94.3	94.8	72.8
M RI	1,356	95.5	3.1	95.4	64.8	95.4	95.4	61.2
Newc	709	99.2	96.6	99.2	77.2	98.9	98.9	77.7
Nottm	712	99.0	97.2	98.5	70.7	98.2	97.6	91.6
Oxford	1,345	98.4	5.1	98.1	50.3	98.1	97.9	39.7
Plymth	349	98.3	92.8	98.3	61.3	98.0	98.0	49.6
Ports	1,051	93.9	36.8	93.3	59.1	93.2	89.6	35.7
Sheff	795	99.3	96.1	99.3	58.4	99.0	99.0	4.5
DIALYSIS CENTRES								
Abrdn	316	98.1		98.1		94.3	94.3	
Airdrie	267	89.1		95.5		95.9	95.1	
Antrim	129	99.2	76.0	99.2	96.9	99.2	99.2	95.4
B Heart	176	94.9	0.0	94.9	72.2	93.8	93.2	34.1
Bangor	97	97.9	73.2	97.9	100.0	97.9	97.9	21.7
Basldn	101	98.0	63.4	97.0	61.4	98.0	91.1	23.8
Bradfd	377	97.9	54.1	97.4	81.4	85.4	79.3	48.8
Brightn	499	97.6	30.3	97.0	77.6	95.6	95.8	50.9
Carlis	158	89.2	0.0	88.0	64.6	87.3	84.2	30.4
Carsh	751	82.6	4.5	82.4	43.0	81.0	80.7	23.7
Chelms	120	86.7	89.2	85.0	82.5	86.7	73.3	30.8
Clwyd	95	96.8	32.6	96.8	99.0	96.8	96.8	81.1
D&Gall	82	93.9		93.9		92.7	90.2	
Derby	253	96.8	94.5	96.4	92.1	96.1	95.7	93.3
Donc	119	100.0	98.3	99.2	84.0	99.2	99.2	23.5
Dorset	404	87.9	45.8	86.9	65.6	86.4	67.3	38.6
Dudley	103	97.1	12.6	97.1	85.4	97.1	97.1	1.0

Table 3.4 Continued

Centre	N with Tx	Data completeness (%)						
		eGFR	Blood pressure	Haemoglobin	Total cholesterol	Adjusted calcium	Phosphate	PTH
Dundee	245	99.2		98.4		98.4	97.6	
Exeter	521	99.6	91.2	99.6	91.9	98.9	97.9	62.6
Glouc	230	97.4	78.7	97.0	50.9	95.2	90.0	17.4
Hull	462	99.1	2.2	96.8	34.4	95.0	94.6	23.8
Inverns	165	89.7		92.7		90.3	90.9	
Ipswi	225	99.6	93.8	99.6	74.7	99.1	99.1	62.2
Kent	614	96.4	95.9	95.9	67.4	95.1	95.0	15.8
Klmarnk	161	97.5		98.1		96.3	96.3	
Krkcldy	152	84.2		98.0		97.4	97.4	
L Kings	445	97.1	0.0	96.9	73.3	96.9	96.9	69.2
Liv Ain	17	94.1	0.0	88.2	58.8	94.1	94.1	70.6
Middlbr	539	93.3	17.3	91.8	38.4	92.0	90.7	10.0
Newry	147	99.3	87.8	98.6	100.0	98.0	98.0	98.6
Norwch	428	99.1	4.4	98.6	98.4	97.7	97.4	29.2
Prestn	697	97.9	0.0	97.6	65.1	95.3	93.3	37.7
Redng	447	99.8	96.4	99.8	66.7	99.3	82.3	48.3
Salford	609	99.0	59.3	99.0	81.1	98.9	99.0	0.2
Shrew	136	86.8	11.0	86.8	80.9	84.6	83.8	17.7
Stevng	385	97.4	0.0	99.2	38.4	94.6	93.0	66.8
Sthend	96	100.0	2.1	100.0	65.6	97.9	92.7	26.0
Stoke	407	99.3	0.3	99.5	99.8	99.0	99.0	78.6
Sund	270	97.8	0.4	97.4	26.7	97.0	97.8	96.3
Swanse	333	99.7	96.7	99.4	66.4	99.1	99.1	64.6
Truro	242	99.2	0.0	99.6	92.2	98.4	98.4	90.5
Ulster	71	98.6	95.8	95.8	98.6	94.4	95.8	9.9
West NI	194	97.4	91.2	92.8	99.0	96.9	96.9	94.3
Wirral	158	93.0	0.6	90.5	42.4	90.5	90.5	47.5
Wolve	197	91.9	63.5	87.8	62.9	85.8	28.9	28.4
Wrexm	168	98.8	88.1	98.8	99.4	98.2	98.2	99.4
York	334	97.9	77.5	97.6	71.3	95.5	95.2	26.1
TOTALS								
England	**29,189**	**95.4**	**41.4**	**96.4**	**69.3**	**95.4**	**93.1**	**46.2**
N Ireland	**1,188**	**98.9**	**89.2**	**97.6**	**99.2**	**98.2**	**98.1**	**56.8**
Scotland	**3,009**	**92.5**		**97.5**		**95.1**	**94.6**	
Wales	**1,734**	**98.9**	**90.0**	**98.7**	**89.8**	**98.5**	**98.5**	**43.6**
UK	**35,120**	**95.4**	**41.9**	**96.6**	**65.4**	**95.6**	**93.6**	**42.0**

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 71 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 3.5 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)	2018 crude rate (pmp)
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018		
TX CENTRES												
B QEH	1,038	1,100	1,235	1,340	1,399	48.7	48.9	51.7	53.3	54.5	1.41	993.4
Belfast	525	562	594	633	671	70.5	73.1	73.2	75.6	76.5	0.51	1321.8
Bristol	862	895	907	906	923	59.1	60.6	61.8	61.6	62.8	1.19	773.7
Camb	850	922	956	1,043	1,056	68.9	70.6	72.0	73.5	74.5	0.96	1100.3
Cardff	1,021	1,036	1,035	1,044	1,072	64.1	64.2	63.6	62.0	62.3	1.21	888.7
Covnt	499	518	529	567	581	52.0	54.0	54.3	58.8	55.8	0.74	785.8
Edinb	458	458	453	483	523	61.3	59.6	58.3	58.6	60.7	0.80	652.0
Glasgw	1,002	1,050	1,106	1,137	1,154	62.4	61.4	63.1	64.1	63.7	1.35	854.1
L Barts	1,026	1,067	1,138	1,195	1,269	46.5	46.8	48.0	48.0	48.6	1.52	836.6
L Guys	1,232	1,302	1,366	1,412	1,453	64.3	64.7	65.1	65.4	65.3	0.90	1619.6
L Rfree	1,152	1,224	1,287	1,344	1,373	57.4	58.5	59.2	61.3	61.5	1.26	1091.1
L St.G	433	456	459	481	497	54.7	54.1	54.1	57.4	59.4	0.66	751.6
L West	1,737	1,784	1,824	1,897	1,983	54.0	54.2	53.8	54.6	55.6	1.99	997.4
Leeds	918	954	977	997	1,054	61.1	62.6	63.0	61.6	62.5	1.38	761.3
Leic	1,115	1,153	1,246	1,302	1,377	52.1	53.0	54.2	54.9	55.8	2.02	682.0
Liv Roy	827	788	779	791	821	65.8	63.7	64.2	63.2	64.3	0.83	990.6
M RI	1,200	1,293	1,382	1,400	1,424	67.0	68.8	70.1	68.5	68.7	1.27	1122.0
Newc	638	647	678	709	733	65.3	64.1	64.6	63.6	63.5	0.93	788.8
Nottm	611	644	678	718	740	57.6	57.9	58.8	61.1	61.9	0.90	820.8
Oxford	1,105	1,164	1,223	1,340	1,402	67.0	68.9	69.3	71.5	72.3	1.40	1000.6
Plymth	326	332	328	339	361	65.1	66.0	63.9	62.8	67.0	0.39	927.2
Ports	895	928	978	1,051	1,073	56.2	55.6	57.9	60.1	60.8	1.68	639.7
Sheff	715	728	752	784	820	52.6	52.6	52.9	54.5	55.4	1.14	721.3
DIALYSIS CENTRES												
Abrdn	271	287	303	311	329	54.1	54.1	54.6	55.2	57.4	0.50	659.2
Airdrie	205	214	230	257	274	51.9	50.4	52.4	55.0	56.3	0.46	596.6
Antrim	95	99	112	120	131	41.1	41.1	44.4	47.1	47.8	0.23	557.6
B Heart	186	182	169	170	182	29.3	27.9	25.9	26.0	26.8	0.61	297.5
Bangor	7	83	89	94	99	6.5	45.6	49.7	48.2	49.0	0.19	534.2
Basldn	78	75	80	99	105	28.1	27.4	29.2	32.9	33.4	0.34	305.2
Bradfd	304	329	360	375	391	55.5	56.4	56.6	55.7	57.0	0.54	723.6
Brightn	421	451	472	487	511	46.0	47.5	47.6	48.2	48.4	1.07	475.4
Carlis	149	162	149	156	161	59.6	57.7	53.0	55.3	55.0	0.27	605.5
Carsh	633	643	680	721	763	40.8	40.7	41.4	42.8	44.0	1.59	481.3
Chelms	100	112	107	117	123	38.2	39.7	39.5	42.2	45.6	0.42	290.7
Clwyd	67	81	89	94	98	39.4	43.8	50.3	52.2	51.6	0.16	608.3
D&Gall	67	65	71	76	83	51.5	50.0	54.2	56.3	57.2	0.12	672.2
Derby	194	213	223	234	258	37.7	39.6	41.1	42.1	43.8	0.58	443.1
Donc	74	97	110	117	120	26.1	32.1	33.2	35.1	36.1	0.34	353.1
Dorset	336	347	368	394	423	50.5	51.0	53.6	53.7	55.3	0.71	592.3
Dudley	75	84	94	95	108	24.6	26.7	27.2	25.8	29.9	0.37	295.0
Dundee	210	216	219	232	256	52.4	51.6	52.4	53.3	57.5	0.39	664.2
Exeter	436	446	477	513	540	46.1	46.1	47.1	48.5	49.6	0.90	598.2
Glouc	172	178	186	214	236	40.2	40.1	39.4	42.2	46.3	0.49	484.9
Hull	395	423	454	460	480	49.3	49.4	53.2	52.7	54.4	0.85	567.5
Inverns	141	147	155	165	169	62.7	58.1	59.9	62.7	60.6	0.22	752.2
Ipswi	210	221	229	233	232	57.2	55.1	55.5	53.8	54.2	0.33	701.6
Kent	539	554	584	594	634	53.2	53.3	54.4	54.5	56.9	1.01	624.8
Klmarnk	128	137	143	159	166	42.8	44.2	45.1	47.2	48.5	0.30	552.1

Table 3.5 Continued

Centre	N with Tx					% with Tx					Estimated catchment population (millions)	2018 crude rate (pmp)
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018		
Krkcldy	119	125	132	149	154	43.0	42.4	44.9	49.2	51.3	0.26	584.5
L Kings	391	428	434	459	482	38.2	39.5	39.1	40.0	40.6	0.97	496.4
Liv Ain	15	15	14	14	19	6.9	6.8	6.2	6.7	8.7	0.40	47.4
Middlbr	507	524	532	536	540	59.3	58.2	59.8	59.2	58.4	0.83	648.9
Newry	99	115	126	138	150	47.8	51.1	53.4	57.3	60.2	0.21	720.4
Norwch	327	347	391	417	441	47.7	48.1	50.8	53.7	56.1	0.65	676.4
Prestn	551	588	601	670	720	47.1	48.4	49.9	52.8	54.5	1.24	581.7
Redng	397	409	431	447	468	52.2	52.8	54.6	56.2	57.8	0.75	620.5
Salford	465	478	510	569	624	47.9	49.1	50.1	51.1	53.2	1.24	505.2
Shrew	124	136	133	137	139	35.5	36.9	35.3	35.7	32.8	0.41	335.0
Stevng	269	295	338	373	394	34.4	36.3	38.2	41.9	41.2	1.00	394.9
Sthend	102	103	92	97	101	42.9	41.9	39.0	38.2	38.9	0.26	384.7
Stoke	356	380	402	408	420	45.9	48.2	48.7	50.4	52.0	0.74	569.6
Sund	223	220	239	262	275	49.6	47.9	47.1	48.3	49.4	0.51	536.5
Swanse	318	329	328	335	346	45.1	43.0	42.4	42.1	42.0	0.75	460.0
Truro	211	231	239	242	249	55.5	55.9	56.1	57.1	57.0	0.34	727.2
Ulster	46	55	58	66	74	30.9	32.5	34.9	36.3	39.0	0.21	349.0
West NI	143	158	169	188	201	52.2	53.9	55.1	60.1	62.0	0.28	716.7
Wirral	51	74	117	155	165	18.4	26.3	34.7	40.3	41.8	0.47	348.1
Wolve	183	185	186	194	199	31.8	31.8	32.6	33.3	33.1	0.55	359.0
Wrexm	140	144	155	170	172	49.5	49.2	50.0	52.8	54.6	0.20	842.8
York	290	301	304	324	338	62.8	61.4	56.8	58.4	59.5	0.41	828.5
TOTALS												
England	**25,943**	**27,130**	**28,427**	**29,899**	**31,180**	**52.3**	**52.9**	**53.7**	**54.2**	**55.1**	**44.02**	**708.3**
N Ireland	**908**	**989**	**1,059**	**1,145**	**1,227**	**56.5**	**58.3**	**59.7**	**62.6**	**64.1**	**1.44**	**850.2**
Scotland	**2,601**	**2,699**	**2,812**	**2,969**	**3,108**	**56.8**	**55.7**	**56.9**	**58.2**	**59.3**	**4.41**	**704.9**
Wales	**1,553**	**1,673**	**1,696**	**1,737**	**1,787**	**54.3**	**55.1**	**55.3**	**54.7**	**55.0**	**2.51**	**712.3**
UK	**31,005**	**32,491**	**33,994**	**35,750**	**37,302**	**52.9**	**53.4**	**54.2**	**54.7**	**55.7**	**52.38**	**712.1**

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.
Rates appear higher than in previous reports because general population estimates now include only those aged ≥18 years (see appendix B).
Cambridge submitted only aggregate data for 2017 and 2018 and are included in this table, but not elsewhere in the chapter.
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 3.6 Demographics of adult patients prevalent to Tx on 31/12/2018 by centre

Centre	N on RRT	N with Tx	% with Tx	Median age (yrs)	% male	Ethnicity				
						% White	% South Asian	% Black	% Other	% missing
TX CENTRES										
B QEH	2,569	1,399	54.5	53.0	58.5	64.3	25.7	7.1	3.0	0.8
Belfast	877	671	76.5	55.0	58.9	97.4	1.4	0.6	0.6	3.6
Bristol	1,469	923	62.8	55.6	60.8	90.1	3.8	4.0	2.1	0.1
Camb										
Cardff	1,721	1,072	62.3	55.0	64.0	93.2	4.2	0.2	2.4	0.2
Covnt	1,042	581	55.8	54.0	63.5	81.1	14.5	3.6	0.9	0.0
Edinb	862	523	60.7	55.4	62.1					72.1
Glasgw	1,812	1,154	63.7	55.3	60.9					75.1
L Barts	2,610	1,269	48.6	52.8	61.0	40.4	30.3	17.5	11.8	0.0
L Guys	2,225	1,453	65.3	52.4	59.4	67.7	8.7	17.7	5.8	0.8
L Rfree	2,234	1,373	61.5	54.1	58.9	49.0	20.7	19.7	10.6	2.0
L St.G	837	497	59.4	56.1	57.8	53.9	21.7	17.3	7.1	3.6
L West	3,566	1,983	55.6	56.8	62.3	44.6	31.0	14.2	10.2	0.0
Leeds	1,687	1,054	62.5	54.6	60.6	80.3	14.1	3.4	2.2	0.2
Leic	2,468	1,377	55.8	55.8	57.8	74.5	20.0	3.9	1.7	1.9
Liv Roy	1,277	821	64.3	55.0	61.5	93.2	1.7	1.8	3.3	0.2
M RI	2,073	1,424	68.7	54.3	60.5	76.9	14.7	5.3	3.1	0.8
Newc	1,155	733	63.5	56.0	59.6	94.3	3.7	0.6	1.5	0.0
Nottm	1,196	740	61.9	54.0	60.3	84.7	8.0	4.6	2.7	0.1
Oxford	1,940	1,402	72.3	54.9	63.2	81.9	10.1	3.7	4.4	7.1
Plymth	539	361	67.0	58.0	66.5	96.4	0.6	0.3	2.8	0.3
Ports	1,764	1,073	60.8	56.1	59.7	93.6	4.0	0.8	1.7	1.3
Sheff	1,481	820	55.4	54.4	62.8	90.3	5.4	1.7	2.6	0.7
DIALYSIS CENTRES										
Abrdn	573	329	57.4	50.8	57.1					49.9
Airdrie	487	274	56.3	54.3	60.6					33.9
Antrim	274	131	47.8	54.8	61.8	100.0	0.0	0.0	0.0	0.0
B Heart	679	182	26.8	54.2	64.3	65.2	24.3	7.7	2.8	0.6
Bangor	202	99	49.0	55.8	62.6	98.0	0.0	1.0	1.0	0.0
Basldn	314	105	33.4	52.6	68.6	85.7	4.8	4.8	4.8	0.0
Bradfd	686	391	57.0	52.5	60.1	55.1	41.5	2.1	1.3	0.3
Brightn	1,055	511	48.4	55.5	61.5	91.0	5.3	2.0	1.8	0.0
Carlis	293	161	54.9	56.3	66.5	97.5	2.5	0.0	0.0	0.0
Carsh	1,736	763	44.0	56.3	63.2	72.4	13.9	8.1	5.7	0.8
Chelms	270	123	45.6	57.4	68.3	86.9	1.6	4.9	6.6	0.8
Colchr	121	0								
Clwyd	190	98	51.6	56.0	61.2	96.9	2.1	0.0	1.0	1.0
D&Gall	145	83	57.2	55.8	60.2					72.3
Derby	589	258	43.8	56.2	61.2	81.0	12.0	2.7	4.3	0.0
Donc	332	120	36.1	56.5	72.5	95.8	2.5	0.0	1.7	0.0
Dorset	765	423	55.3	59.4	57.2	98.1	0.5	0.0	1.4	0.2
Dudley	361	108	29.9	57.3	67.6	82.4	13.0	2.8	1.9	0.0
Dundee	445	256	57.5	55.2	60.2					53.1
Exeter	1,088	540	49.6	56.0	58.0	98.2	0.2	0.6	1.1	0.0

Table 3.6 Continued

Centre	N on RRT	N with Tx	% with Tx	Median age (yrs)	% male	Ethnicity				
						% White	% South Asian	% Black	% Other	% missing
Glouc	510	236	46.3	56.4	61.4	94.5	3.4	0.9	1.3	0.0
Hull	883	480	54.4	54.6	63.8	96.9	1.5	0.4	1.3	0.8
Inverns	279	169	60.6	54.0	55.0	95.9	0.8	3.3	0.0	28.4
Ipswi	428	232	54.2	57.6	66.8	85.3	2.6	1.7	10.4	0.4
Kent	1,114	634	56.9	56.5	58.4	92.9	4.1	0.8	2.2	0.0
Klmarnk	342	166	48.5	56.0	59.6					39.8
Krkcldy	300	154	51.3	56.3	59.1					69.5
L Kings	1,186	482	40.6	56.8	63.7	50.1	12.9	30.4	6.7	0.2
Liv Ain	218	19	8.7	47.9	57.9	100.0	0.0	0.0	0.0	0.0
Middlbr	925	540	58.4	56.4	63.5	95.0	3.7	0.2	1.1	0.0
Newry	249	150	60.2	55.8	54.7	98.0	0.0	1.3	0.7	0.0
Norwch	786	441	56.1	57.0	60.1	96.6	1.4	0.9	1.1	0.0
Prestn	1,322	720	54.5	55.3	61.1	87.4	11.5	0.6	0.6	0.0
Redng	810	468	57.8	57.5	63.3	67.1	25.3	5.2	2.5	4.5
Salford	1,173	624	53.2	55.0	56.9	84.9	12.0	1.8	1.3	0.2
Shrew	424	139	32.8	54.9	59.0	94.2	2.9	1.4	1.4	0.0
Stevng	957	394	41.2	54.8	61.7	71.7	17.7	7.2	3.3	1.3
Sthend	260	101	38.8	55.4	56.4	83.2	3.0	3.0	10.9	0.0
Stoke	808	420	52.0	54.3	60.7	91.6	5.3	1.2	1.9	1.0
Sund	557	275	49.4	55.8	60.0	96.4	2.9	0.7	0.0	0.0
Swanse	824	346	42.0	57.3	61.3	98.0	1.7	0.0	0.3	0.6
Truro	437	249	57.0	56.3	57.4	97.6	0.4	0.0	2.0	0.0
Ulster	190	74	38.9	55.4	58.1	97.3	1.4	1.4	0.0	0.0
West NI	324	201	62.0	52.7	60.7	98.0	1.0	0.5	0.5	0.0
Wirral	395	165	41.8	57.0	62.4	96.4	1.8	0.6	1.2	0.0
Wolve	602	199	33.1	53.0	55.8	72.6	19.3	7.1	1.0	1.0
Wrexm	315	172	54.6	52.3	66.9	95.9	1.2	0.0	2.9	0.0
York	568	338	59.5	56.1	58.6	97.3	1.2	0.3	1.2	3.0
TOTALS										
England	**54,784**	**30,124**	**55.0**	**55.2**	**60.8**	**76.5**	**13.0**	**6.5**	**4.0**	**1.0**
N Ireland	**1,914**	**1,227**	**64.1**	**54.8**	**58.9**	**97.8**	**1.0**	**0.7**	**0.5**	**2.0**
Scotland	**5,245**	**3,108**	**59.3**	**54.8**	**60.1**					**61.7**
Wales	**3,252**	**1,787**	**55.0**	**55.5**	**63.5**	**94.8**	**3.1**	**0.2**	**1.9**	**0.3**
UK	**65,195**	**36,246**	**55.6**	**55.2**	**60.8**	**78.4**	**11.9**	**6.0**	**3.7**	**6.2**

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.

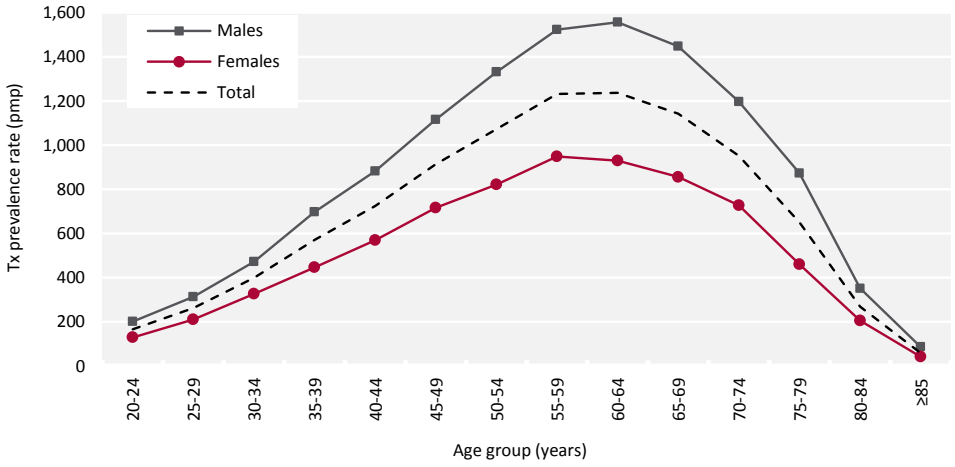

Figure 3.6 Adult Tx prevalence rate on 31/12/2018 by age group and sex
pmp – per million population

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 3.7). Comparison to dialysis populations is shown in chapter 2. 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 3.7 Primary renal diseases (PRDs) of adult patients incident to Tx in 2018 and adult patients prevalent to Tx on 31/12/2018

	Incident Tx		Prevalent Tx	
PRD	N	%	N	%
Diabetes	556	18.0	4,123	11.6
Glomerulonephritis	663	21.4	8,278	23.2
Hypertension	197	6.4	1,918	5.4
Polycystic kidney disease	377	12.2	4,929	13.8
Pyelonephritis	254	8.2	4,227	11.9
Renal vascular disease	52	1.7	416	1.2
Other	585	18.9	6,579	18.5
Uncertain aetiology	411	13.3	5,169	14.5
Total (with data)	**3,095**	**100.0**	**35,639**	**100.0**
Missing	173	5.3	606	1.7

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).

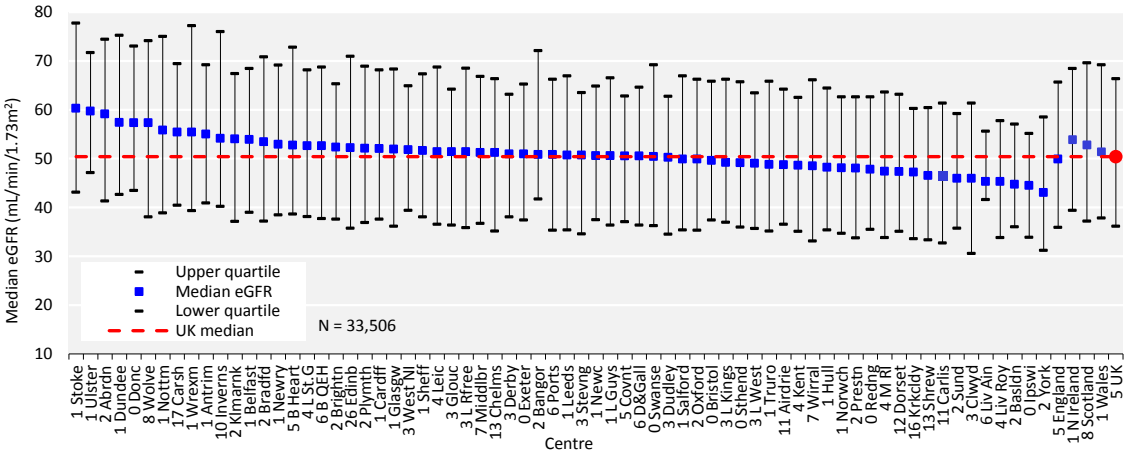

Figure 3.7 Median estimated glomerular filtration rate (eGFR) in adult patients prevalent to Tx on 31/12/2018 by centre

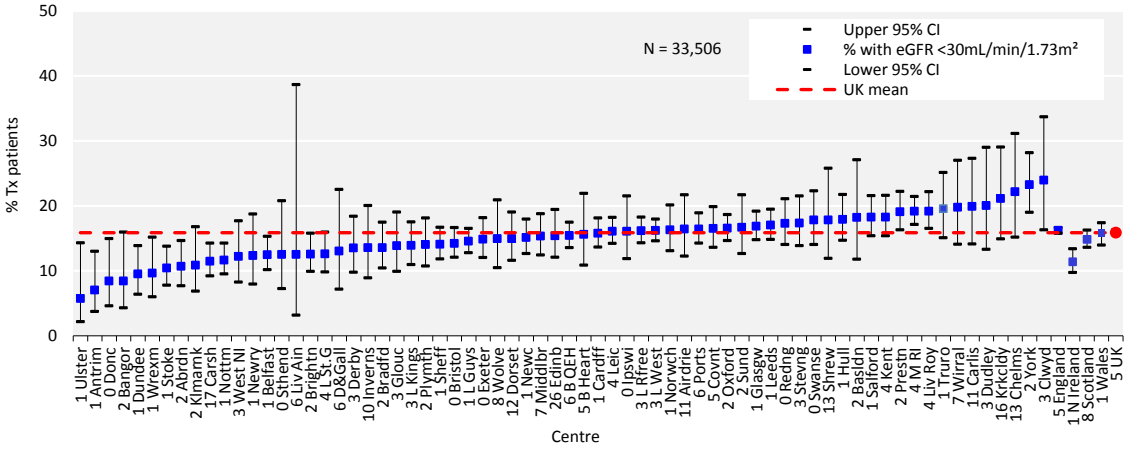

Figure 3.8 Percentage of adult patients prevalent to Tx on 31/12/2018 with an estimated glomerular filtration rate (eGFR) <30mL/min/1.73m^2 by centre
CI – confidence interval

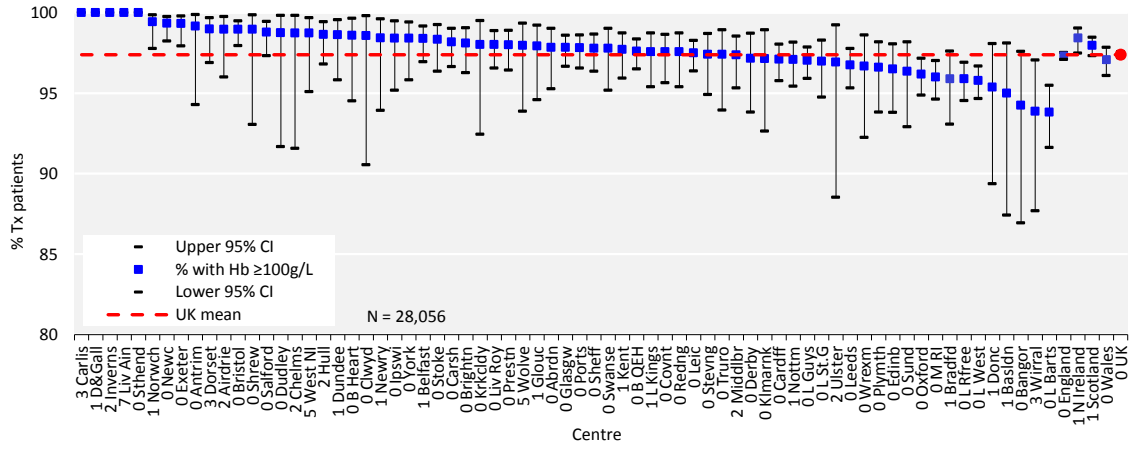

Figure 3.9 Percentage of adult patients prevalent to Tx on 31/12/2018 with an estimated glomerular filtration rate (eGFR) ≥30mL/min/1.73m^2 achieving haemoglobin (Hb) ≥100g/L by centre
CI – confidence interval

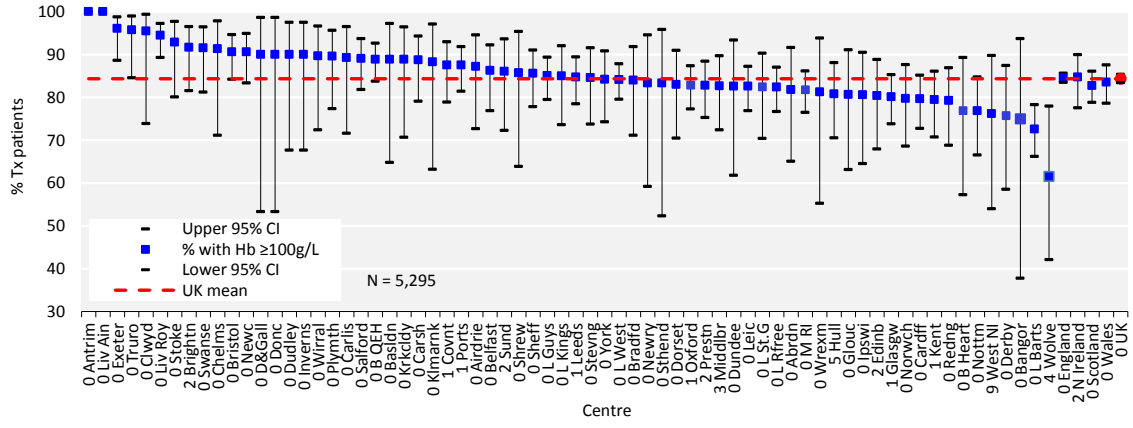

Figure 3.10 Percentage of adult patients prevalent to Tx on 31/12/2018 with an estimated glomerular filtration rate (eGFR) <30mL/min/1.73m^2 achieving haemoglobin (Hb) ≥100g/L by centre
CI – confidence interval

Blood pressure in prevalent adult kidney Tx patients

Blood pressure data completeness was variable (table 3.4) 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.

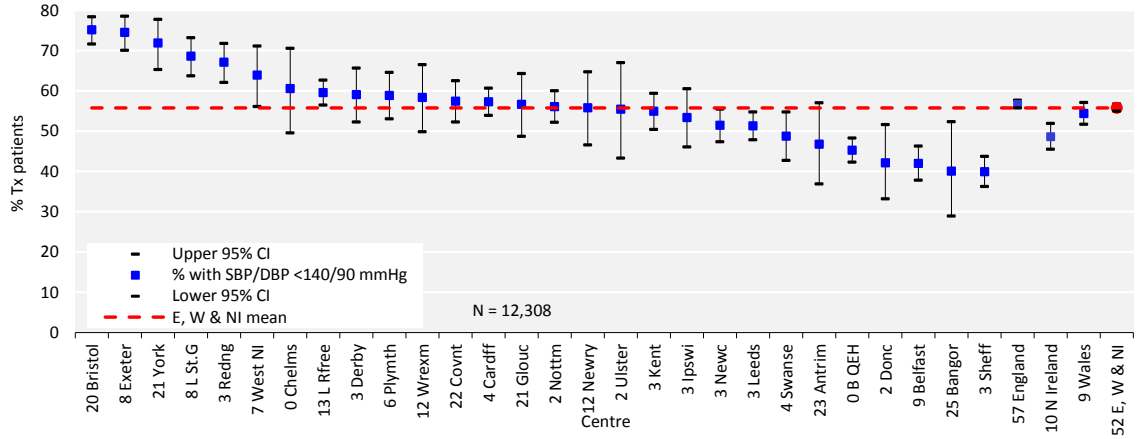

Figure 3.11 Percentage of adult patients prevalent to Tx on 31/12/2018 with estimated glomerular filtration rate (eGFR) ≥30 mL/min/1.73m^2 achieving blood pressure of <140/90 mmHg by centre
CI – confidence interval; DBP – diastolic blood pressure; SBP – systolic blood pressure

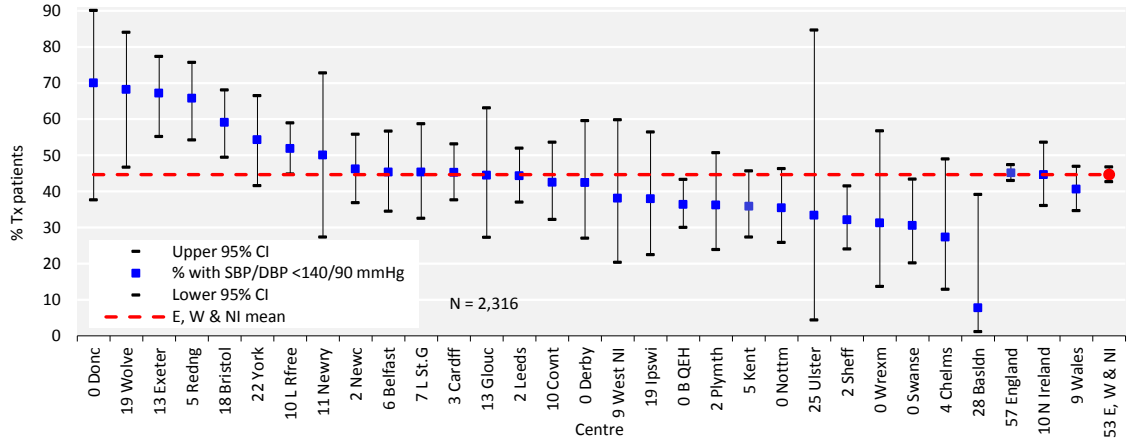

Figure 3.12 Percentage of adult patients prevalent to Tx on 31/12/2018 with estimated glomerular filtration rate (eGFR) <30 mL/min/1.73m^2 achieving blood pressure of <140/90 mmHg by centre
CI – confidence interval; DBP – diastolic blood pressure; SBP – systolic blood pressure

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 3.8 Estimated glomerular filtration rate (eGFR), blood pressure and biochemical parameters in adult patients prevalent to Tx on 31/12/2018 compared with adult patients prevalent to dialysis on 31/12/2018 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	11,294	16,899	4,539	781	22,016
%	33.7	50.4	13.5	2.3	
eGFR (mL/min/1.73m²)					
mean ± SD	76.8 ± 13.4	45.3 ± 8.4	23.7 ± 4.1	11.8 ± 2.4	
median	73.9	45.4	24.2	12.5	
SBP (mmHg)					
mean ± SD	135 ± 17	138 ± 18	141 ± 19	144 ± 20	134 ± 25
% ≥140 mmHg	35.2	42.1	50.8	58.6	39.5
DBP (mmHg)					
mean ± SD	80 ± 10	80 ± 11	80 ± 11	82 ± 12	69 ± 15
% ≥90 mmHg	17.3	17.5	17.3	22.9	8.7
Total cholesterol (mmol/L)					
mean ± SD	4.3 ± 1.0	4.4 ± 1.1	4.5 ± 1.2	4.5 ± 1.3	3.8 ± 1.1
% ≥4.0 mmol/L	62.8	65.4	65.3	63.6	39.7
Haemoglobin (g/L)					
mean ± SD	137 ± 16	129 ± 17	116 ± 16	107 ± 16	110 ± 14
% <100 g/L	1.5	3.4	13.0	30.9	20.1
Phosphate (mmol/L)					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.1 ± 0.3	1.4 ± 0.4	1.6 ± 0.4
% >1.7 mmol/L	0.1	0.3	1.6	18.3	39.6
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	26.1	26.3	21.6	16.7	16.2
% <2.2 mmol/L	3.1	3.6	7.7	15.8	16.4
PTH (pmol/L)					
median	8.6	9.7	15.1	27.5	31.9
% >72 pmol/L	0.5	0.5	2.6	12.1	17.1

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 01/01/2008 and 31/12/2016 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 3.9 Differences in median estimated glomerular filtration rate (eGFR) slope between demographic subgroups of adult patients who received their first kidney Tx between 01/01/2008 and 31/12/2016

Characteristic	N	Median slope	Lower quartile	Upper quartile
Age at Tx (yrs)				
<40	4,800	-1.38	-4.58	0.81
40-55	7,152	-0.61	-2.85	1.24
>55	7,091	-0.70	-3.12	1.10
Ethnicity				
White	13,753	-0.64	-3.00	1.13
South Asian	2,252	-1.40	-4.31	0.93
Black	1,328	-1.63	-4.80	0.70
Other	624	-1.01	-3.66	1.12
Sex				
Male	11,676	-0.52	-2.91	1.29
Female	7,367	-1.31	-3.98	0.70
Diabetes				
No Diabetes	15,966	-0.69	-3.16	1.14
Diabetes	2,897	-1.46	-4.20	0.73
Tx donor				
Deceased	12,352	-0.81	-3.38	1.16
Living	6,691	-0.76	-3.23	1.00
Year of Tx				
2008	1,813	-0.80	-2.44	0.46
2009	1,904	-0.88	-2.72	0.42
2010	1,990	-0.78	-2.66	0.60
2011	1,966	-0.72	-2.93	0.91
2012	2,175	-0.95	-3.11	0.81
2013	2,387	-0.99	-3.54	0.98
2014	2,323	-0.67	-3.51	1.66
2015	2,267	-0.63	-4.07	2.38
2016	2,218	-0.46	-5.78	4.27
Status of Tx patients at end of follow-up				
Died	1,540	-1.16	-4.13	1.24
Graft failed	1,524	-6.43	-12.68	-3.27
Re-transplanted	86	-3.96	-7.29	-1.62
Graft functioning	15,979	-0.49	-2.61	1.25
Total	**19,043**	**-0.80**	**-3.33**	**1.09**

Survival of adult kidney Tx patients

Survival of incident and prevalent RRT patients is described in detail in chapters 1 and 2, respectively. Survival of incident Tx patients is reported in table 3.3. 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 31/12/2017 and followed-up for one year in 2018, with comparisons between Tx and dialysis presented in table 3.10. 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 3.10 Cause of death in adult patients prevalent to RRT on 31/12/2017 followed-up in 2018 by modality

	All modalities		Dialysis		Tx	
Cause of death	N	%	N	%	N	%
Cardiac disease	786	20.7	662	21.5	124	17.5
Cerebrovascular disease	147	3.9	122	4.0	25	3.5
Infection	715	18.9	548	17.8	167	23.6
Malignancy	335	8.8	186	6.0	149	21.0
Treatment withdrawal	666	17.6	647	21.0	19	2.7
Other	769	20.3	623	20.2	146	20.6
Uncertain aetiology	371	9.8	293	9.5	78	11.0
Total (with data)	**3,789**	**100.0**	**3,081**	**100.0**	**708**	**100.0**
Missing	1,717	31.2	1,360	30.6	357	33.5

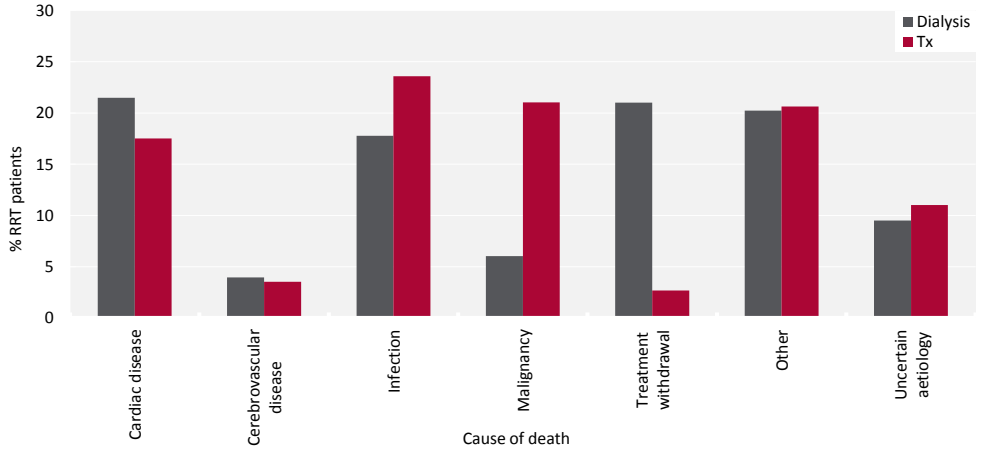

Figure 3.13 Cause of death for adult patients prevalent to RRT on 31/12/2017 followed-up in 2018 by modality

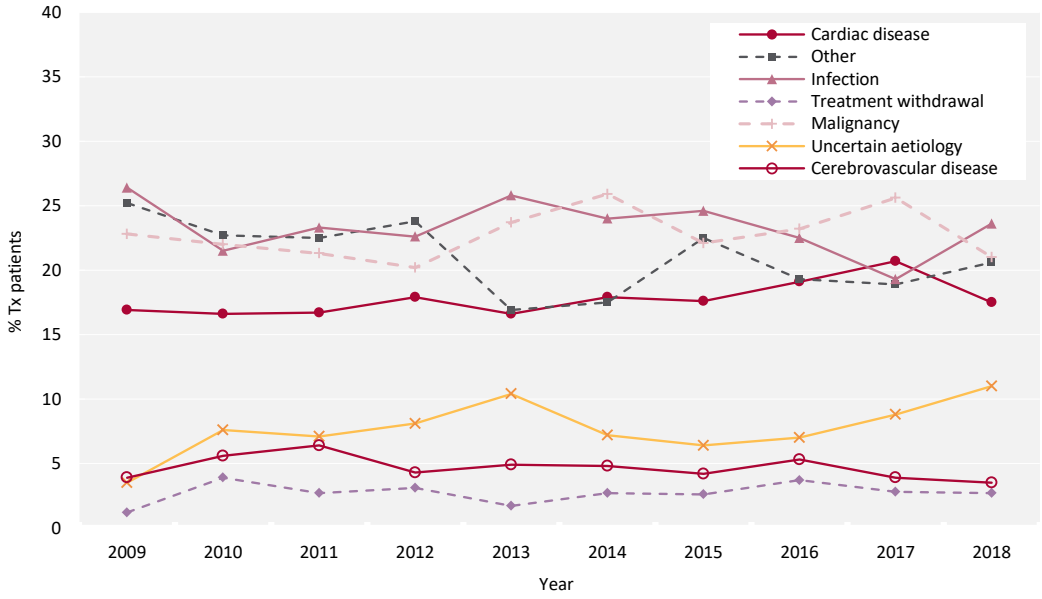

Figure 3.14 Cause of death between 2009 and 2018 for adult patients prevalent to Tx at the beginning of the year