

Chapter 4

Adults with a kidney transplant (Tx) in the UK at the end of 2021

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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 2021 (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 kidney replacement therapy (KRT). 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.

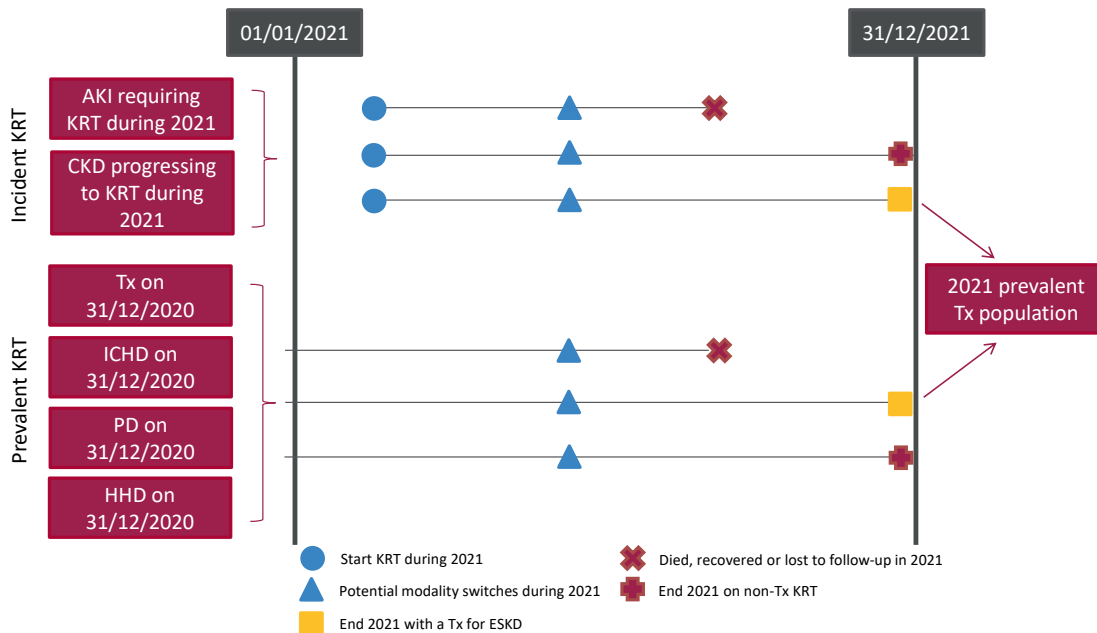


Figure 4.1 Pathways adult patients could follow to be included in the UK 2021 prevalent Tx population

Note that patients receiving dialysis for acute kidney injury (AKI) are only included in this chapter if they had a timeline or KRT modality code for Tx at the end of 2021 or if they had been on KRT for ≥ 90 days and were on Tx at the end of 2021

AKI – acute kidney injury; CKD – chronic kidney disease; HHD – home haemodialysis; ICHD – in-centre haemodialysis; PD – peritoneal dialysis; Tx - Transplantation

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 UK Kidney 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 2021 prevalent adult Tx population is described, including the number transplanted per million population (pmp).

The UK Kidney Association guidelines (ukkidney.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 kidney centres in 2021 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 (ukkidney.org/audit-research/data-portals). 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 kidney 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 UK Kidney Association audit measures relevant to Tx that are reported in this chapter

The UK Kidney 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 (2020)	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 2021, 23 of the 68 adult kidney 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 kidney 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. Exeter was unable to submit patient level data for 2021. Aggregate numbers by modality were provided, enabling inclusion in Tables 4.5 and 4.6. Exeter is excluded from all other analyses.

Key findings

- 39,189 adult patients had a kidney Tx for ESKD in the UK on 31/12/2021, which represented 56.4% of the KRT population.
- The median age of kidney Tx patients was 56.5 years and 60.8% were male.
- There was a 15% increase in overall kidney Tx performed in 2021 compared to 2020, with a increase in kidney Tx from LKDs by 36%, DCDs by 24% and a 1% decrease in DBDs. Transplant activity has not yet recovered to pre-pandemic levels.
- The median eGFR for kidney Tx patients 1 year after transplantation was 56.5 mL/min/1.73m² from LKD, 51.5 mL/min/1.73m² from DBD and 47.1 mL/min/1.73m² from DCD.
- 16.3% of kidney Tx patients had eGFR <30 mL/min/1.73m².
- The median decline in eGFR slope beyond the first year after transplantation was 0.8 mL/min/1.73m²/year.
- There was no cause of death data available for 39.6% of deaths on Tx. For those Tx patients with data, the leading cause of death was infection (37.1%) compared to 32% in 2020 and 18.7% the previous year. The continuing increase is most likely due to COVID related deaths.

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, 2019–2021 calendar years

Organ	2019	2020	2021	% change 2020-2021
Kidney DBD ¹	1,417	1,220	1,209	-1
Kidney DCD ²	1024	683	845	24
Kidney LKD	1,042	587	801	36
Kidney and liver ³	18	5	9	80
Kidney and heart	1	0	2	
Kidney and pancreas ⁴	157	97	111	14
Kidney and pancreas islets ⁵	7	4	7	
Small bowel (inc kidney)	4	0	0	50
Total kidney Tx	3,670	2,596	2,983	15

¹Includes en bloc transplants (5 in 2019, 2 in 2020, and 2 in 2021) and double kidney transplants (18 in 2019, 10 in 2020, 10 in 2021)

²Includes en bloc transplants (3 in 2019, 2 in 2020, and 5 in 2021) and double kidney transplants (24 in 2019, 9 in 2020, and 18 in 2021)

³Includes DCD transplants (45 in 2019, 23 in 2020, and 31 in 2021)

⁴Includes DCD transplants (1 in 2021)

⁵Includes DCD transplants (2 in 2019 and 2 in 2021)

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 KRT start, is shown for patients incident to KRT in 2019, adjusted by sex, age and primary renal disease (PRD) (figure 4.2). The analysis for LKD transplantation only is shown separately (figure 4.3).

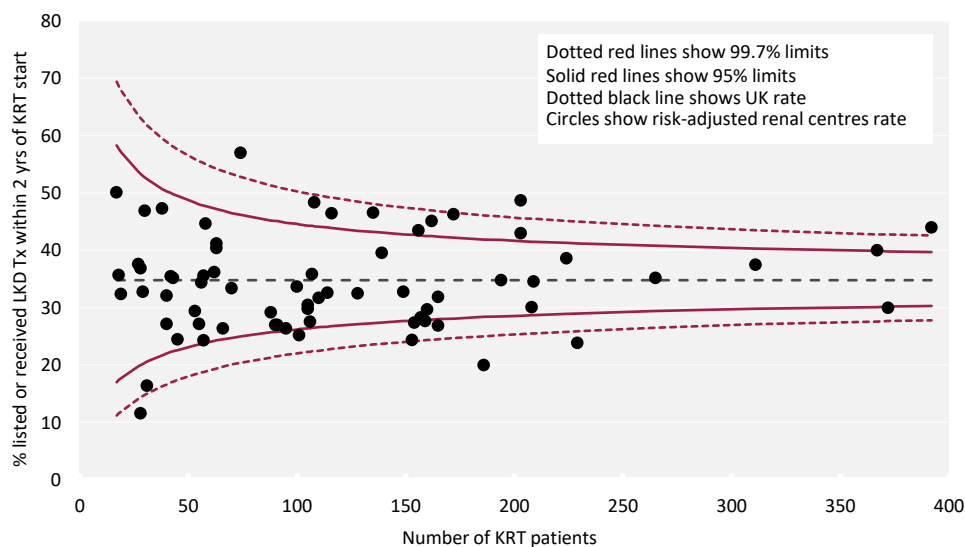


Figure 4.2 Percentage of adult patients incident to KRT in 2019 who were waitlisted or received a living kidney donor (LKD) Tx within 2 years of KRT start adjusted by age, sex and primary renal disease by centre

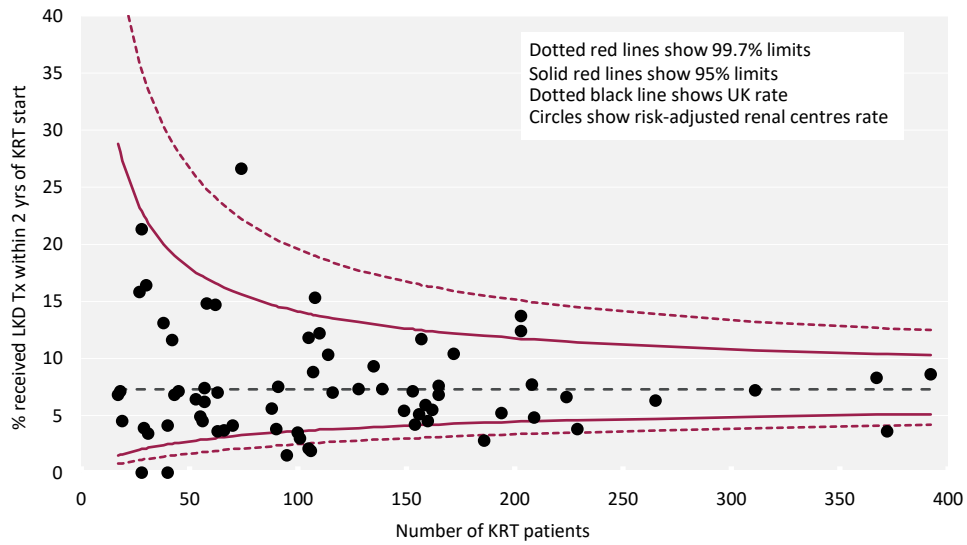


Figure 4.3 Percentage of adult patients incident to KRT in 2019 who received a living kidney donor (LKD) Tx within 2 years of KRT start adjusted by age, sex and primary renal disease by centre

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 centre¹ (cohorts detailed in footnote)

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

Cohorts for survival rate estimation: 1 year survival: 1/4/2017–31/03/2021; 5 year survival: 1/4/2013–31/3/2017; 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

Centres have been omitted where less than 75% of the data was reported

¹Information 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 (<https://nhsbtbde.blob.core.windows.net/umbraco-assets-corp/26790/kidney-annual-report-2020-21.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 2014–2020) was 97.0%.

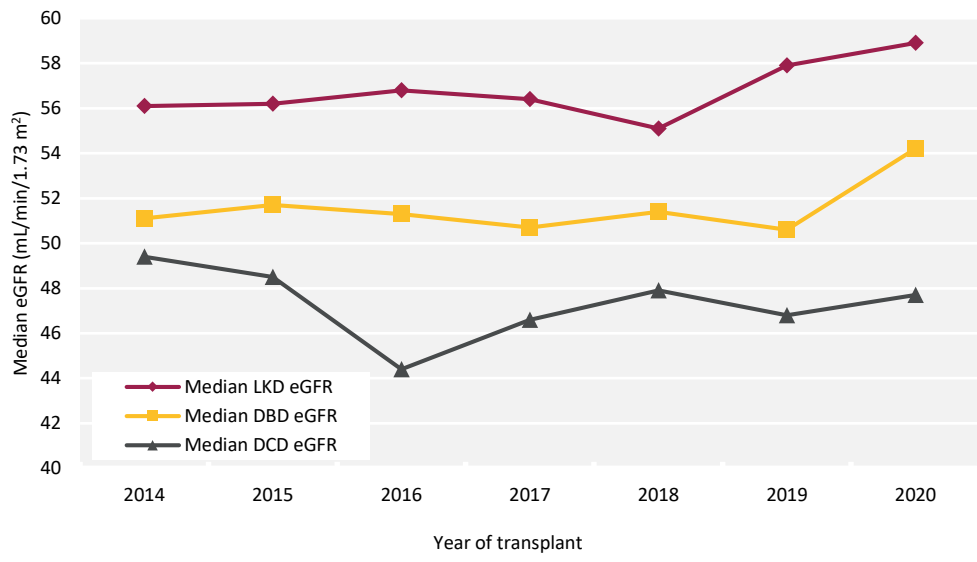


Figure 4.4 Median estimated glomerular filtration rate (eGFR) for kidney Tx at 1 year by donor type and year of transplantation between 2014 and 2020

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

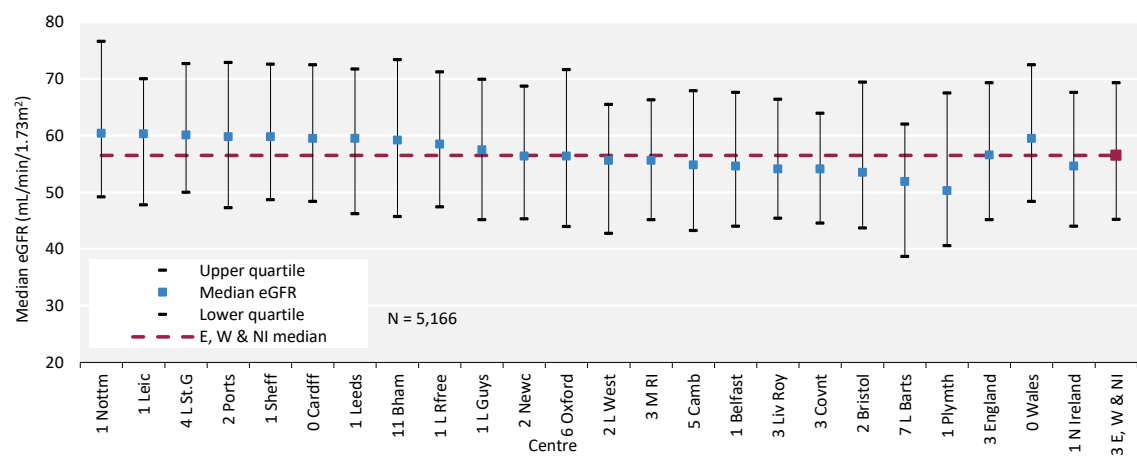


Figure 4.5 Median estimated glomerular filtration rate (eGFR) at 1 year post-living kidney donor (LKD) Tx by transplanting centre for transplantation that occurred between 2014 and 2020

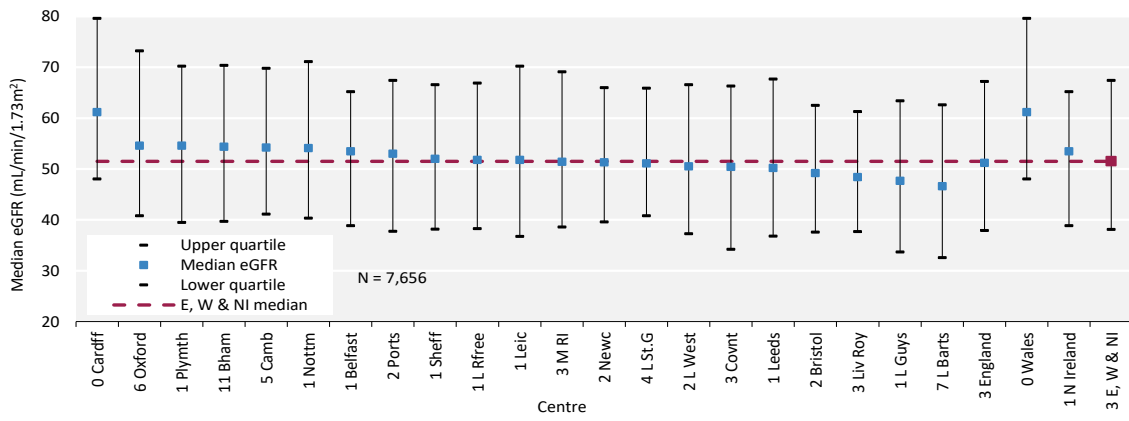


Figure 4.6 Median estimated glomerular filtration rate (eGFR) at 1 year post-donor after brain death (DBD) Tx by transplanting centre for transplantation that occurred between 2014 and 2020

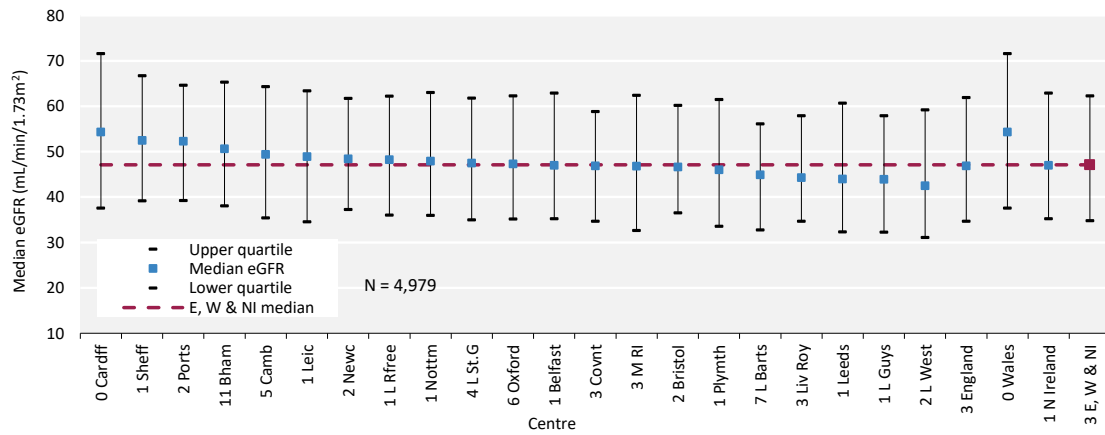


Figure 4.7 Median estimated glomerular filtration rate (eGFR) at 1 year post-donor after circulatory death (DCD) Tx by transplanting centre for transplantation that occurred between 2014 and 2020

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 31/12/2021

Centre	N with Tx	Data completeness (%)						
		eGFR	Blood pressure	Haemoglobin	Total cholesterol	Adjusted calcium	Phosphate	PTH
TX CENTRES								
Bham	1,574	90.9	75.7	90.7	81.5	89.8	89.5	1.8
Belfast	720	98.9	95.0	98.3	98.9	98.3	98.3	26.9
Bristol	902	98.9	85.5	98.2	93.1	98.5	98.0	96.7
Camb	1,167	93.2	0.0	93.3	76.4	89.1	88.4	83.0
Cardff	1,032	98.1	93.3	97.6	64.1	97.5	97.5	13.7
Covnt	629	94.6	54.4	95.6	68.2	94.9	41.2	38.6
L Barts	1,322	90.5	0.2	90.2	91.2	89.5	89.6	90.2
L Guys	1,451	94.3	0.0	93.6	41.5	91.0	91.0	24.1
L Rfree	1,418	93.4	78.8	92.8	65.0	88.9	88.7	62.6
L St.G	467	93.8	75.2	93.8	69.4	89.3	89.3	87.6
L West	1,957	93.0	0.0	92.7	33.9	91.7	92.5	27.9
Leeds	1,108	98.1	83.8	97.8	95.8	96.5	89.3	43.3
Leic	1,432	96.0	0.6	96.3	93.2	95.0	94.4	40.1
Liv Roy	742	95.7	1.2	65.6	55.4	92.9	94.3	0.9
M RI	1,317	92.6	5.4	92.4	72.7	92.3	92.3	71.3
Newc	781	93.5	58.0	93.2	38.7	93.0	92.8	60.3
Nottm	705	98.3	92.9	95.6	72.5	96.7	96.0	82.0
Oxford	1,399	84.9	0.0	85.0	42.9	82.3	82.2	40.5
Plymth	341	97.7	90.9	97.4	79.8	97.1	95.0	70.4
Ports	1,091	92.4	16.7	92.1	48.1	90.1	83.8	35.6
Sheff	782	96.9	77.4	96.4	38.0	96.2	96.2	18.3
DIALYSIS CENTRES								
Antrim	161	99.4	41.6	99.4	99.4	98.1	98.1	36.0
Bangor	103	95.2	38.8	95.2	99.0	95.2	95.2	35.0
Bradfd	406	97.8	2.0	97.3	81.0	88.7	85.0	55.7
Brightn	554	98.0	22.6	98.0	79.6	96.8	96.6	61.4
Carlis	156	81.4	0.0	80.1	54.5	77.6	75.0	43.0
Carsh	840	80.2	3.7	79.5	38.7	78.8	78.7	32.4
Clwyd	102	99.0	1.0	98.0	99.0	97.1	97.1	72.6
Derby	297	98.3	92.9	98.3	96.0	97.6	97.6	87.5
Donc	144	100.0	75.0	99.3	58.3	97.9	96.5	11.8
Dorset	438	74.4	23.1	80.8	61.9	81.1	62.1	48.4
Dudley	127	97.6	11.0	97.6	84.3	97.6	96.9	0.0
EssexMS	338	89.4	17.8	92.3	63.3	80.5	74.9	12.1
Exeter								
Glouc	276	95.3	54.0	94.9	49.6	92.0	88.8	26.8
Hull	484	98.4	1.2	98.6	37.2	95.3	95.0	14.9
Ipswi	240	91.3	9.2	90.4	62.9	90.0	89.6	59.6
Kent	626	97.6	91.7	97.8	38.3	96.8	96.8	10.9
L Kings	506	96.8	0.2	96.6	77.9	96.8	96.6	81.6
Liv Ain	44	95.5	4.6	54.6	61.4	93.2	93.2	2.3
Middlbr	561	85.0	0.0	84.1	46.0	81.3	78.6	8.4
Newry	172	97.7	66.9	96.5	98.8	94.8	95.4	98.3

Table 4.4 Continued

Centre	N with Tx	Data completeness (%)						
		eGFR	Blood pressure	Haemoglobin	Total cholesterol	Adjusted calcium	Phosphate	PTH
Norwch	442	97.5	0.5	96.8	96.2	88.7	88.5	20.1
Prestn	757	95.9	0.0	95.9	62.4	92.1	91.3	32.2
Redng	504	98.4	63.7	98.4	38.1	97.6	97.2	19.6
Salford	679	98.5	0.0	98.1	97.4	97.9	97.8	0.2
Shrew	163	82.8	26.4	82.8	67.5	71.8	71.8	14.1
Stevng	391	97.4	79.0	95.9	40.2	92.8	91.8	50.9
Stoke	424	97.2	0.0	97.6	98.4	96.9	96.9	72.6
Sund	280	96.8	0.0	96.4	52.9	96.8	96.4	60.7
Swanse	342	99.4	95.6	99.1	63.5	98.8	98.8	74.9
Truro	247	98.4	0.0	98.0	59.1	96.8	96.8	58.7
Ulster	100	95.0	93.0	95.0	100.0	95.0	95.0	13.0
West NI	219	98.2	60.7	96.4	100.0	96.8	96.8	93.6
Wirral	187	94.1	1.6	67.9	75.4	79.7	87.2	8.0
Wolve	237	94.5	62.0	91.1	87.3	93.7	46.0	59.1
Wrexm	175	97.1	76.6	97.1	98.3	96.6	96.6	97.7
York	338	98.2	66.3	97.9	68.3	95.6	94.4	19.8
TOTALS								
England	31,271	93.6	30.5	92.4	64.8	91.5	89.0	43.6
N Ireland	1,372	98.4	79.6	97.7	99.2	97.4	97.5	46.6
Wales	1,754	98.1	83.5	97.7	71.4	97.5	97.5	38.7
E, W & NI	34,397	94.0	35.1	92.9	66.5	92.0	89.8	43.5

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

Exeter was unable to submit patient level data for 2021

For the 67 adult kidney centres, the number of prevalent patients with a Tx was calculated as both a proportion of the prevalent patients on KRT 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 KRT 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)	2021 crude rate (pmp)
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021		
TX CENTRES												
Belfast	641	673	692	721	744	76.0	76.7	78.6	81.0	81.7	0.53	1,393
Bham	1,517	1,575	1,630	1,603	1,615	47.8	48.5	49.2	49.2	48.8	2.05	786
Bristol	907	925	939	928	926	61.6	62.9	63.2	62.9	61.9	1.22	758
Camb	978	1,019	1,109	1,181	1,221	73.2	73.5	76.2	78.3	75.0	0.94	1,303
Cardff	1,044	1,073	1,083	1,066	1,060	62.0	62.4	62.6	63.5	62.4	1.16	916
Covnt	567	579	620	636	646	58.7	60.4	57.6	57.7	57.7	0.80	812
Edinb	482	522	546	565	603	58.4	60.6	61.7	63.6	65.1	0.84	717
Glasgw	1,136	1,156	1,216	1,240	1,242	64.1	63.8	65.6	67.1	66.6	1.37	904
L Barts	1,200	1,266	1,379	1,349	1,373	48.0	48.7	51.9	50.2	49.9	1.59	863
L Guys	1,416	1,458	1,550	1,512	1,481	65.4	65.4	66.8	65.3	63.8	1.01	1,472
L Rfree	1,346	1,374	1,426	1,426	1,462	61.4	61.5	60.8	61.0	61.4	1.33	1,101
L St.G	487	494	501	478	486	58.1	59.2	58.8	56.1	56.1	0.67	731
L West	1,894	1,975	2,042	2,025	2,014	54.5	55.5	56.6	57.4	56.6	1.96	1,025
Leeds	999	1,054	1,082	1,117	1,135	61.7	62.6	62.7	63.8	63.6	1.37	827
Leic	1,290	1,363	1,442	1,494	1,452	54.7	55.6	55.9	57.0	55.0	2.09	696
Liv Roy	792	815	814	769	761	63.2	64.1	64.7	63.7	63.1	0.81	937
M RI	1,407	1,422	1,400	1,326	1,385	68.6	68.8	68.4	66.8	66.7	1.33	1,038
Newc	710	732	765	781	799	63.6	63.5	65.3	65.3	65.2	0.95	838
Nottm	727	743	751	734	726	61.4	62.1	61.7	60.7	59.5	0.93	781
Oxford	1,346	1,407	1,435	1,456	1,455	71.6	72.4	72.7	72.2	72.6	1.45	1,006
Plymth	341	362	360	359	349	63.0	67.0	67.3	66.2	63.7	0.40	869
Ports	1,053	1,070	1,133	1,108	1,117	60.3	60.7	60.2	58.4	57.6	1.75	638
Sheff	787	821	835	804	804	54.6	55.4	56.1	54.0	53.7	1.13	709
DIALYSIS CENTRES												
Abrdn	311	328	343	349	367	55.2	57.3	61.5	61.8	63.5	0.50	733
Airdrie	257	274	296	292	280	55.2	56.2	56.5	56.5	55.6	0.46	610
Antrim	120	131	145	161	161	47.1	47.8	50.9	56.1	54.4	0.25	655
Bangor	94	100	106	107	107	48.2	49.3	52.7	49.5	49.3	0.16	653
Bradfd	376	392	412	416	416	55.8	57.0	56.3	57.5	56.6	0.49	847
Brightn	487	510	545	556	569	48.1	48.3	51.2	51.6	52.1	1.08	528
Carlis	156	162	155	152	158	55.5	55.3	51.5	51.2	51.8	0.26	619
Carsh	724	766	834	843	860	42.7	43.7	46.8	45.6	45.1	1.63	528
Clwyd	94	98	104	107	103	52.5	51.6	50.7	52.5	50.5	0.18	569
D&Gall	76	83	87	89	92	56.3	57.2	58.4	57.1	59.7	0.12	751
Derby	234	258	296	300	306	42.2	44.0	45.3	44.4	44.4	0.56	545
Donc	117	119	132	140	146	35.1	36.1	38.6	41.1	43.1	0.38	389
Dorset	394	422	436	449	445	54.0	55.2	56.4	56.3	56.6	0.73	610
Dudley	95	106	111	123	128	26.0	29.4	30.3	33.1	32.2	0.34	372
Dundee	232	254	259	253	240	53.3	57.1	57.7	58.8	58.4	0.37	652
EssexMS	312	331	328	351	352	37.6	39.2	38.5	39.7	39.3	0.99	354
Exeter	514	537	541	535	512	48.6	49.6	49.7	49.0	47.5	0.95	537
Glouc	216	243	269	266	284	42.3	46.6	50.7	51.0	52.0	0.51	557
Hull	461	480	498	498	494	52.9	54.6	55.1	54.5	53.8	0.80	617
Inverns	164	169	171	170	172	62.6	60.6	60.6	62.7	61.9	0.22	769
Ipswi	236	232	240	255	246	54.1	54.2	56.1	59.9	58.4	0.31	787
Kent	595	633	649	639	644	54.5	56.9	57.0	55.9	54.0	1.07	602
Klmarnk	159	167	182	181	178	47.2	49.1	50.7	49.1	48.8	0.29	609
Krkldy	149	153	143	136	121	49.0	51.3	48.5	46.7	41.0	0.27	442
L Kings	461	480	525	513	530	39.9	40.6	42.1	41.0	39.7	0.93	567
Liv Ain	15	20	29	41	48	7.1	9.2	12.8	16.9	18.2	0.43	111
Middlbr	537	539	558	573	569	59.4	58.0	58.6	60.6	59.6	0.81	705

Table 4.5 Continued

Centre	N with Tx					% with Tx					Estimated catchment population (millions)	2021 crude rate (pmp)
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021		
Newry	138	152	162	173	179	57.3	60.3	64.0	65.5	63.7	0.24	761
Norwch	422	445	454	461	445	54.0	56.5	56.1	57.1	56.8	0.69	645
Prestn	672	721	745	771	781	52.8	54.5	55.5	56.4	56.6	1.23	633
Redng	448	468	483	500	514	56.4	57.5	56.0	57.5	58.6	0.70	736
Salford	572	621	687	690	688	51.2	52.9	55.3	54.4	56.6	1.15	597
Shrew	139	146	151	166	171	35.9	34.0	34.6	38.9	38.7	0.41	417
Stevng	366	378	381	380	410	41.4	40.3	39.7	39.0	40.4	1.11	369
Stoke	409	419	439	430	432	50.4	52.0	54.5	52.9	51.1	0.73	590
Sund	264	278	280	296	285	48.5	49.6	49.1	53.2	52.1	0.55	521
Swanse	334	346	358	353	359	42.3	41.9	41.2	41.5	42.1	0.76	473
Truro	243	249	261	259	250	57.2	57.0	58.0	58.2	54.2	0.36	698
Ulster	67	75	81	102	101	36.6	39.3	43.8	50.8	49.8	0.20	497
West NI	188	202	207	223	225	60.1	61.8	63.1	63.5	66.4	0.25	896
Wirral	159	169	183	195	194	40.8	42.3	44.0	47.1	47.1	0.47	413
Wolve	195	204	228	239	243	33.5	33.5	37.1	36.5	35.2	0.55	443
Wrexm	171	171	175	177	181	52.9	54.5	56.3	54.8	60.3	0.21	870
York	325	340	349	338	347	58.4	59.8	60.0	59.1	59.7	0.49	714
TOTALS												
England	29,908	31,122	32,412	32,461	32,674	54.7	55.5	56.3	56.1	55.6	44.77	730
N Ireland	1,154	1,233	1,287	1,380	1,410	62.9	64.2	66.6	69.2	69.5	1.47	959
Scotland	2,966	3,106	3,243	3,275	3,295	58.2	59.3	60.6	61.4	61.3	4.45	740
Wales	1,737	1,788	1,826	1,810	1,810	54.8	55.0	55.1	55.3	55.3	2.49	727
UK	35,765	37,249	38,768	38,926	39,189	55.2	56.0	56.8	56.9	56.4	53.19	737

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 kidney centre)

Exeter was unable to submit 2021 patient level data but provided aggregate numbers of patients on KRT at the end of 2021 by treatment modality

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 31/12/2021 by centre

Centre	N on KRT	N with Tx	% with Tx	Median age (yrs)	% male	Ethnicity				% missing
						% White	% South Asian	% Black	% Other	
TX CENTRES										
Belfast	911	744	81.7	56.6	60.5	97.7	1.9	0.3	0.1	2.7
Bham	3,309	1,615	48.8	53.5	58.0	61.1	28.8	7.2	2.8	0.8
Bristol	1,497	926	61.9	56.7	59.5	89.6	3.7	4.8	2.0	0.2
Camb	1,629	1,221	75.0	55.6	62.2	89.3	6.5	2.6	1.7	0.5
Cardff	1,700	1,060	62.4	56.3	62.9	92.2	5.2	0.9	1.8	1.0
Covnt	1,119	646	57.7	55.3	61.3	78.1	17.2	4.3	0.3	0.2
Edinb	926	603	65.1	57.0	64.3					76.1
Glasgw	1,865	1,242	66.6	56.6	58.9					44.5
L Barts	2,750	1,373	49.9	54.5	59.2	39.1	34.4	19.6	6.9	0.6
L Guys	2,322	1,481	63.8	54.4	60.4	65.4	10.7	19.3	4.6	1.2
L Rfree	2,380	1,462	61.4	55.9	60.8	46.6	22.6	18.5	12.4	4.5
L St.G	866	486	56.1	58.0	56.2	48.3	25.6	17.3	8.8	3.7
L West	3,556	2,014	56.6	58.4	63.0	43.1	34.4	15.1	7.4	0.1
Leeds	1,784	1,135	63.6	55.7	60.3	79.5	15.1	4.2	1.2	0.0
Leic	2,640	1,452	55.0	57.2	58.0	72.5	21.0	4.9	1.7	1.4
Liv Roy	1,207	761	63.0	56.1	62.3	92.9	2.5	2.6	2.0	0.5
M RI	2,077	1,385	66.7	55.5	59.9	76.2	14.6	7.1	2.3	0.7
Newc	1,226	799	65.2	57.4	58.6	94.0	4.5	0.8	0.8	0.1
Nottm	1,220	726	59.5	55.4	59.9	85.3	6.8	5.0	3.0	0.0
Oxford	2,003	1,455	72.6	56.3	62.3	79.9	11.6	4.1	4.3	9.6
Plymth	548	349	63.7	58.7	67.1	96.6	1.2	0.3	2.0	0.0
Ports	1,941	1,117	57.5	56.9	58.1	93.9	3.8	0.7	1.7	2.5
Sheff	1,496	804	53.7	55.8	63.2	89.3	6.6	1.6	2.5	1.4
DIALYSIS CENTRES										
Abrdn	578	367	63.5	53.8	57.8					58.3
Airdrie	504	280	55.6	55.6	59.3	95.8	2.3	0.4	1.5	5.7
Antrim	296	161	54.4	57.5	60.9	99.4	0.0	0.6	0.0	1.2
Bangor	217	107	49.3	57.5	65.4	99.1	0.0	0.0	1.0	1.9
Bradfd	735	416	56.6	52.3	60.8	52.9	44.0	2.4	0.7	0.0
Brightn	1,092	569	52.1	57.0	62.2	91.3	5.5	1.1	2.1	0.9
Carlis	305	158	51.8	57.8	62.7	98.1	1.9	0.0	0.0	0.0
Carsh	1,907	860	45.1	58.1	62.3	70.6	16.8	8.7	3.9	0.6
Colchr	145	0								
Clwyd	204	103	50.5	58.2	61.2	97.0	2.0	1.0	0.0	1.9
D&Gall	154	92	59.7	58.5	63.0	97.2	1.4	0.0	1.4	22.8
Derby	689	306	44.4	58.5	62.1	82.0	12.4	2.6	2.9	0.0
Donc	339	146	43.1	57.8	65.1	95.9	2.8	0.7	0.7	0.7
Dorset	786	445	56.6	60.2	59.3	96.6	1.6	0.5	1.4	0.0
Dudley	398	128	32.2	57.3	68.8	80.5	14.1	3.1	2.3	0.0
Dundee	411	240	58.4	57.3	59.6					58.8
EssexMS	895	352	39.3	58.0	63.1	87.1	4.9	4.0	4.0	0.6
Exeter	1,077	512	47.5							
Glouc	546	284	52.0	59.4	59.5	92.9	4.2	1.1	1.8	0.4
Hull	919	494	53.8	55.8	64.4	96.6	1.4	0.6	1.4	0.2
Inverns	278	172	61.9	55.6	57.6					37.8
Ipswi	421	246	58.4	59.0	61.0	83.7	3.3	4.5	8.6	0.4
Kent	1,192	644	54.0	57.3	59.0	91.6	3.9	1.4	3.1	0.3

Table 4.6 Continued

Centre	N on KRT	N with Tx	% with Tx	Median age (yrs)	% male	Ethnicity				
						% White	% South Asian	% Black	% Other	% missing
Klmarnk	365	178	48.8	57.1	61.2					43.8
Krkcdy	295	121	41.0	57.9	61.2					75.2
L Kings	1,334	530	39.7	57.3	62.3	49.3	17.4	28.7	4.5	0.2
Liv Ain	264	48	18.2	52.9	62.5	91.7	0.0	2.1	6.3	0.0
Middlbr	955	569	59.6	57.7	62.4	94.9	3.3	0.7	1.1	0.0
Newry	281	179	63.7	56.7	59.2	98.3	0.6	0.6	0.6	1.1
Norwch	784	445	56.8	58.5	60.2	97.8	1.1	0.7	0.5	0.0
Prestn	1,379	781	56.6	56.8	60.4	84.8	14.0	0.9	0.4	0.0
Redng	877	514	58.6	58.5	62.7	65.7	23.6	4.9	5.8	5.3
Salford	1,215	688	56.6	57.0	60.5	82.0	14.4	2.2	1.5	0.0
Shrew	442	171	38.7	55.3	62.6	93.0	3.5	2.3	1.2	0.0
Stevng	1,014	410	40.4	57.2	63.7	69.0	20.2	8.3	2.4	0.0
Stoke	845	432	51.1	54.3	63.4	91.5	5.4	1.4	1.7	1.6
Sund	547	285	52.1	57.2	60.0	95.1	3.2	0.7	1.1	0.4
Swanse	853	359	42.1	57.0	61.8	96.9	2.0	0.0	1.1	0.3
Truro	461	250	54.2	58.5	58.0	97.6	0.8	0.0	1.6	0.0
Ulster	203	101	49.8	57.4	58.4	92.1	4.0	3.0	1.0	0.0
West NI	339	225	66.4	55.5	59.6	99.1	0.5	0.5	0.0	0.4
Wirral	412	194	47.1	59.0	67.0	95.9	3.1	0.5	0.5	0.0
Wolve	691	243	35.2	56.0	58.4	67.5	24.7	6.6	1.2	0.0
Wrexm	300	181	60.3	54.5	65.8	95.0	1.7	0.6	2.8	0.6
York	581	347	59.7	57.5	60.2	95.7	1.7	0.3	2.3	0.3
TOTALS										
England	58,817	32,674	55.6	56.5	60.8	75.3	14.5	6.9	3.4	1.3
N Ireland	2,030	1,410	69.5	56.6	60.1	97.8	1.4	0.6	0.2	1.8
Scotland	5,376	3,295	61.3	56.3	60.1					49.7
Wales	3,274	1,810	55.3	56.4	63.0	94.1	3.7	0.6	1.6	0.9
UK	69,497	39,189	56.4	56.5	60.8	77.6	13.1	6.2	3.1	5.4

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

Exeter was unable to submit 2021 patient level data but provided aggregate numbers of patients on KRT at the end of 2021 by treatment modality

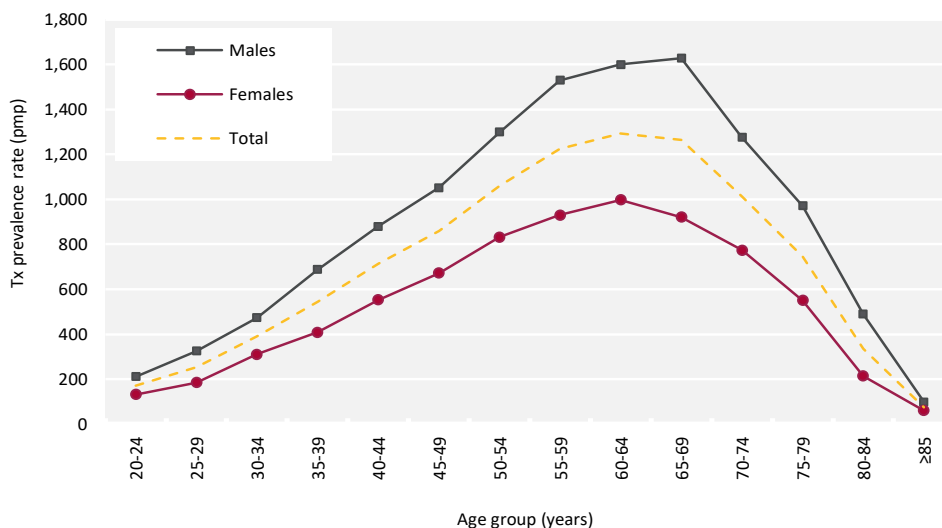


Figure 4.8 Adult Tx prevalence rate on 31/12/2021 by age group and sex
pmp – per million population

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 2021 and adult patients prevalent to Tx on 31/12/2021

PRD	Incident Tx		Prevalent Tx	
	N	%	N	%
Diabetes	496	18.7	4,565	12.0
Glomerulonephritis	631	23.7	8,934	23.5
Hypertension	168	6.3	2,047	5.4
Polycystic kidney disease	294	11.1	5,152	13.5
Pyelonephritis	227	8.5	4,262	11.2
Renal vascular disease	49	1.8	472	1.2
Other	473	17.8	7,339	19.3
Uncertain aetiology	321	12.1	5,302	13.9
Total (with data)	2,659	100.0	38,073	100.0
Missing	140	5.0	604	1.6

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/1.73m² and the proportion of patients achieving an adequate haemoglobin level (defined as a haemoglobin ≥100 g/L).

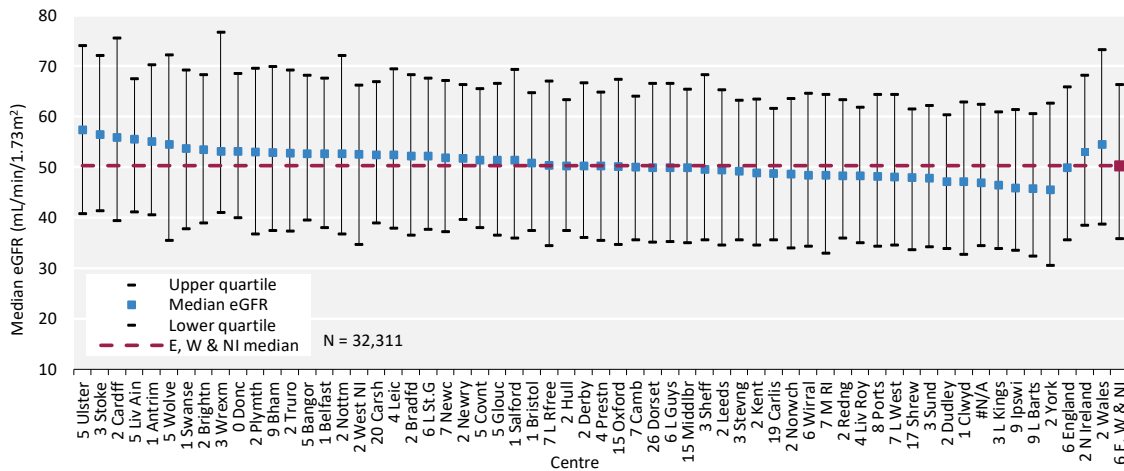


Figure 4.9 Median estimated glomerular filtration rate (eGFR) in adult patients prevalent to Tx on 31/12/2021 by centre

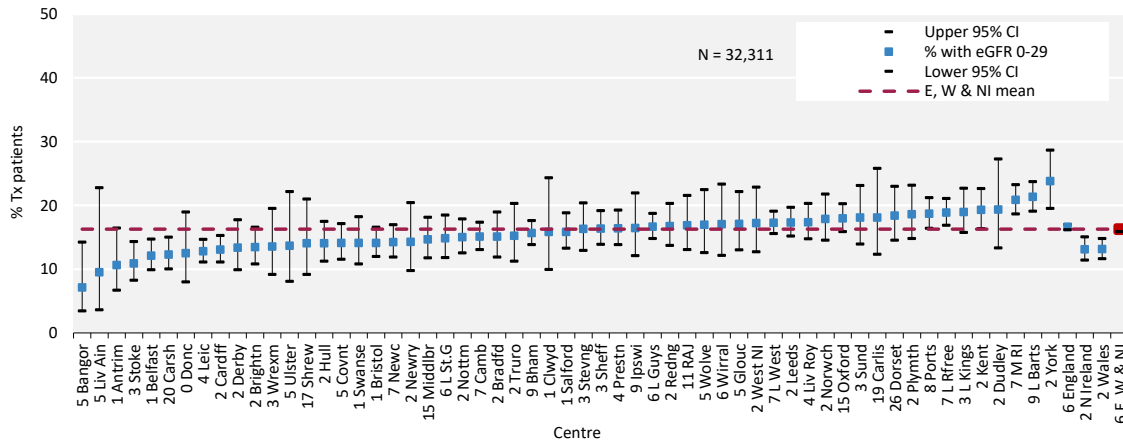


Figure 4.10 Percentage of adult patients prevalent to Tx on 31/12/2021 with an estimated glomerular filtration rate (eGFR) <30mL/min/1.73m² by centre
CI – confidence interval

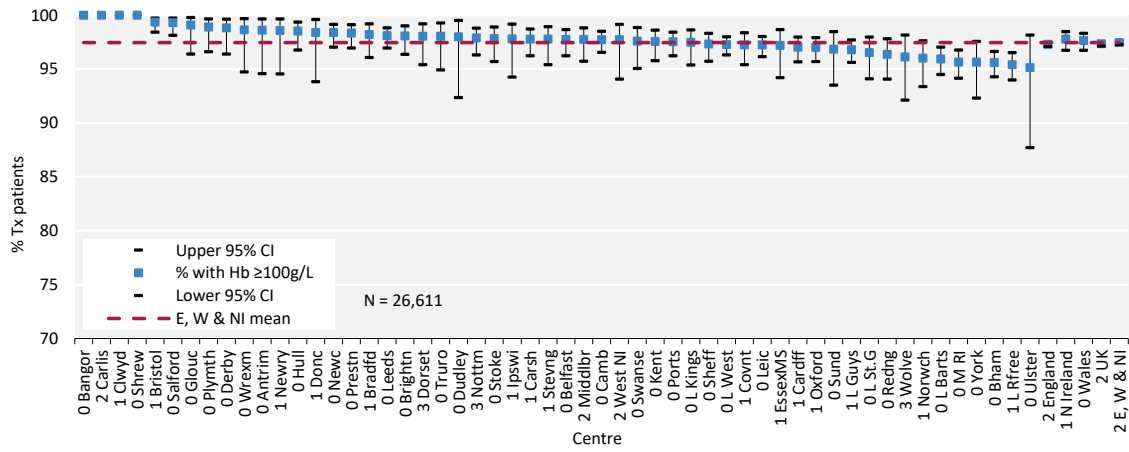


Figure 4.11 Percentage of adult patients prevalent to Tx on 31/12/2021 with an estimated glomerular filtration rate (eGFR) $\geq 30 \text{ mL/min/1.73m}^2$ achieving haemoglobin (Hb) $\geq 100 \text{ g/L}$ by centre
 CI – confidence interval

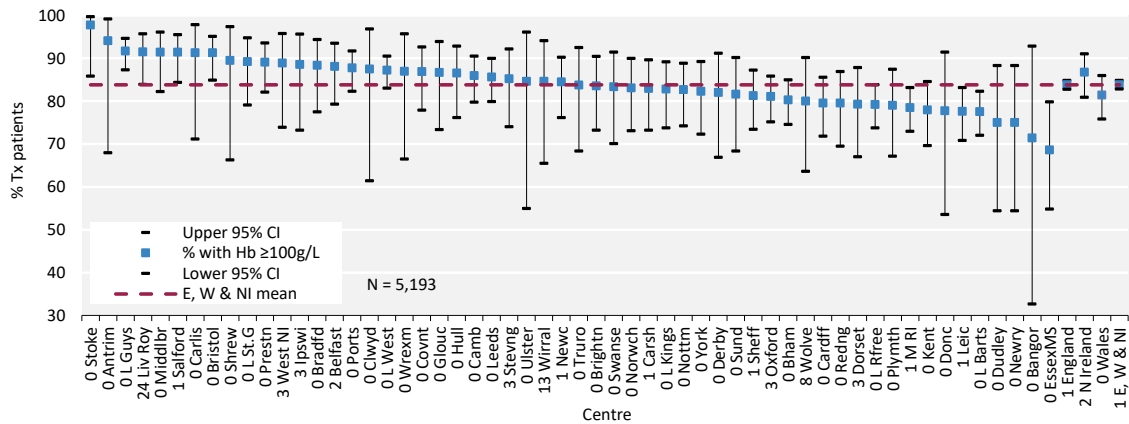


Figure 4.12 Percentage of adult patients prevalent to Tx on 31/12/2021 with an estimated glomerular filtration rate (eGFR) $< 30 \text{ mL/min/1.73m}^2$ achieving haemoglobin (Hb) $\geq 100 \text{ g/L}$ by centre
 CI – confidence interval

Blood pressure in prevalent adult kidney Tx patients

Blood pressure data completeness was variable (table 4.4) and only centres with $\geq 70\%$ 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.

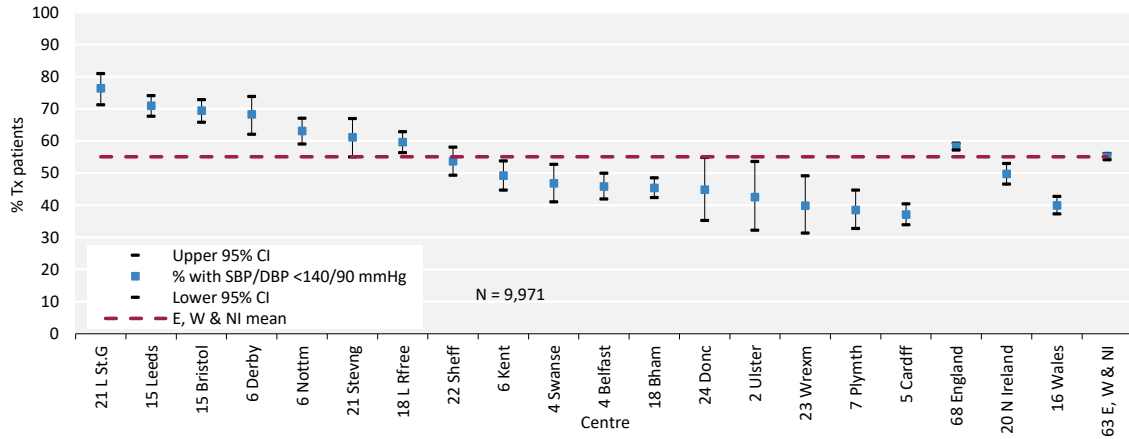


Figure 4.13 Percentage of adult patients prevalent to Tx on 31/12/2021 with estimated glomerular filtration rate (eGFR) ≥ 30 mL/min/1.73m² achieving blood pressure of <140/90 mmHg by centre
CI – confidence interval; DBP – diastolic blood pressure; SBP – systolic blood pressure

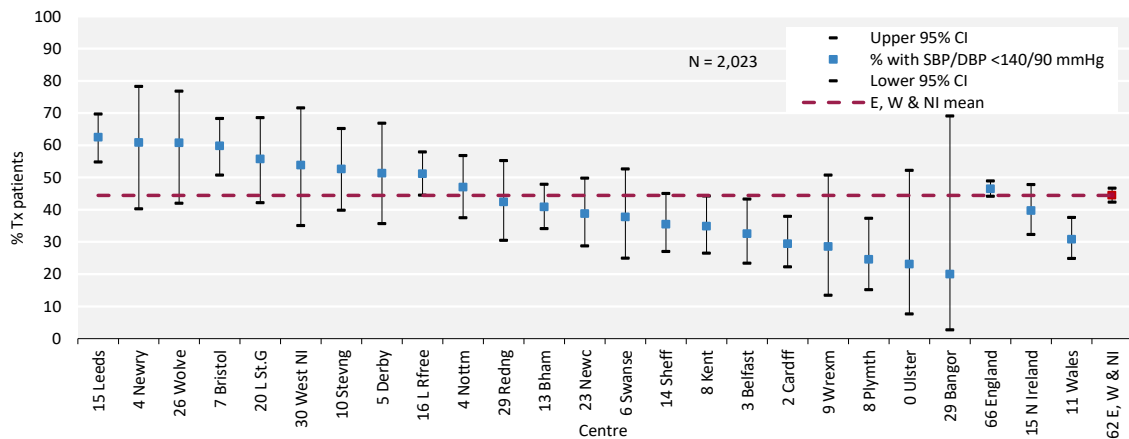


Figure 4.14 Percentage of adult patients prevalent to Tx on 31/12/2021 with estimated glomerular filtration rate (eGFR) <30 mL/min/1.73m² achieving blood pressure of <140/90 mmHg by centre
CI – confidence interval; DBP – diastolic blood pressure; SBP – systolic blood pressure

Biochemistry parameters in prevalent adult kidney Tx patients

The attainment of audit standards is shown by stage of Tx kidney 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 31/12/2021 compared with adult patients prevalent to dialysis on 31/12/2021 by CKD stage

Characteristic	Tx CKD stage (eGFR)				Prevalent dialysis Stage 5D
	Stage 1-2T (≥ 60 mL/min/1.73 m ²)	Stage 3T (30-59 mL/min/1.73 m ²)	Stage 4T (15-29 mL/min/1.73 m ²)	Stage 5T (<15 mL/min/1.73 m ²)	
N	10,919	16,147	4,463	796	22,343
%	33.8	50.0	13.8	2.5	
eGFR (mL/min/1.73m²)					
mean \pm SD	77.0 \pm 13.4	45.3 \pm 8.4	23.6 \pm 4.2	11.5 \pm 2.4	
median	73.9	45.5	24.1	12.0	
SBP (mmHg)					
mean \pm SD	136 \pm 17	138 \pm 18	142 \pm 19	147 \pm 22	137 \pm 25
% ≥ 140 mmHg	37.4	41.8	51.0	59.3	43.6
DBP (mmHg)					
mean \pm SD	81 \pm 10	80 \pm 11	80 \pm 13	83 \pm 13	71 \pm 15
% ≥ 90 mmHg	18.1	18.5	19.4	24.2	10.7
Total cholesterol (mmol/L)					
mean \pm SD	4.4 \pm 1.0	4.5 \pm 1.1	4.5 \pm 1.2	4.5 \pm 1.3	3.9 \pm 1.1
% ≥ 4.0 mmol/L	65.0	66.6	65.2	62.6	40.1
Haemoglobin (g/L)					
mean \pm SD	138 \pm 16	129 \pm 17	116 \pm 16	107 \pm 16	110 \pm 14
% <100 g/L	1.5	3.5	13.4	31.7	20.1
Phosphate (mmol/L)					
mean \pm SD	1.0 \pm 0.2	1.0 \pm 0.2	1.1 \pm 0.3	1.5 \pm 0.4	1.7 \pm 0.5
% >1.7 mmol/L	0.2	0.3	2.3	21.1	43.5
Adjusted Ca (mmol/L)					
mean \pm SD	2.4 \pm 0.1	2.4 \pm 0.1	2.4 \pm 0.1	2.4 \pm 0.2	2.4 \pm 0.2
% >2.5 mmol/L	26.7	27.2	20.5	15.3	16.6
% <2.2 mmol/L	2.0	2.7	5.6	17.9	16.6
PTH (pmol/L)					
median	8.4	9.8	15.9	30.9	34.1
% >72 pmol/L	0.5	0.7	3.2	13.4	18.9

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 01/01/2011 and 31/12/2019 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 01/01/2011 and 31/12/2019

Characteristic	N	Median slope	Lower quartile	Upper quartile
Age at Tx (yrs)				
<40	4,916	-1.33	-4.56	0.86
40-55	8,461	-0.68	-3.09	1.14
>55	7,411	-0.67	-3.08	1.11
Ethnicity				
White	14,634	-0.70	-3.11	1.08
Asian	2,882	-1.22	-4.07	1.02
Black	1,587	-1.41	-4.62	0.75
Other	622	-0.94	-3.37	0.80
Sex				
Male	12,843	-0.58	-3.04	1.23
Female	7,945	-1.24	-3.94	0.78
Diabetes				
No Diabetes	16,996	-0.71	-3.19	1.10
Diabetes	3,483	-1.37	-4.27	0.85
Tx donor				
Deceased	14,159	-0.85	-3.47	1.11
Living	6,629	-0.76	-3.20	1.01
Year of Tx				
2011	1,970	-0.87	-2.91	0.44
2012	2,178	-1.02	-3.04	0.36
2013	2,395	-1.02	-3.10	0.53
2014	2,329	-0.82	-2.98	0.71
2015	2,314	-0.69	-2.90	0.99
2016	2,387	-0.78	-3.36	1.25
2017	2,543	-0.69	-3.59	1.52
2018	2,463	-0.47	-3.92	2.48
2019	2,209	-0.67	-5.85	4.11
Status of Tx patients at end of follow-up				
Died	2,223	-1.28	-4.30	1.02
Graft failed	1,825	-6.09	-11.77	-3.10
Re-transplanted	75	-3.07	-6.72	-1.31
Graft functioning	16,740	-0.46	-2.58	1.27
Total	20,788	-0.82	-3.39	1.07

Survival of adult kidney Tx patients

Survival of incident and prevalent KRT 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 KRT on 31/12/2020 and followed-up for one year in 2021, 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 KRT 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 KRT on 31/12/2020 followed-up in 2021 by modality

Cause of death	All modalities		Dialysis		Tx	
	N	%	N	%	N	%
Cardiac disease	715	17.9	613	20.7	102	9.9
Cerebrovascular disease	97	2.4	73	2.5	24	2.3
Infection	1,119	28.0	735	24.9	384	37.1
Malignancy	263	6.6	144	4.9	119	11.5
Treatment withdrawal	437	11.0	422	14.3	15	1.5
Other	1,032	25.9	747	25.3	285	27.6
Uncertain aetiology	327	8.2	222	7.5	105	10.2
Total (with data)	3,990	100.0	2,956	100.0	1,034	100.0
Missing	2,411	37.7	1,734	37.0	677	39.6

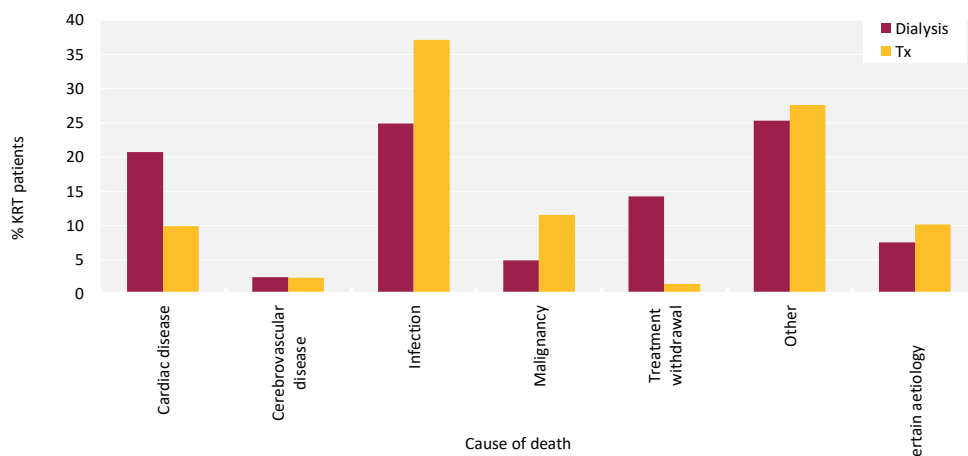


Figure 4.15 Cause of death for adult patients prevalent to KRT on 31/12/2020 followed-up in 2021 by modality

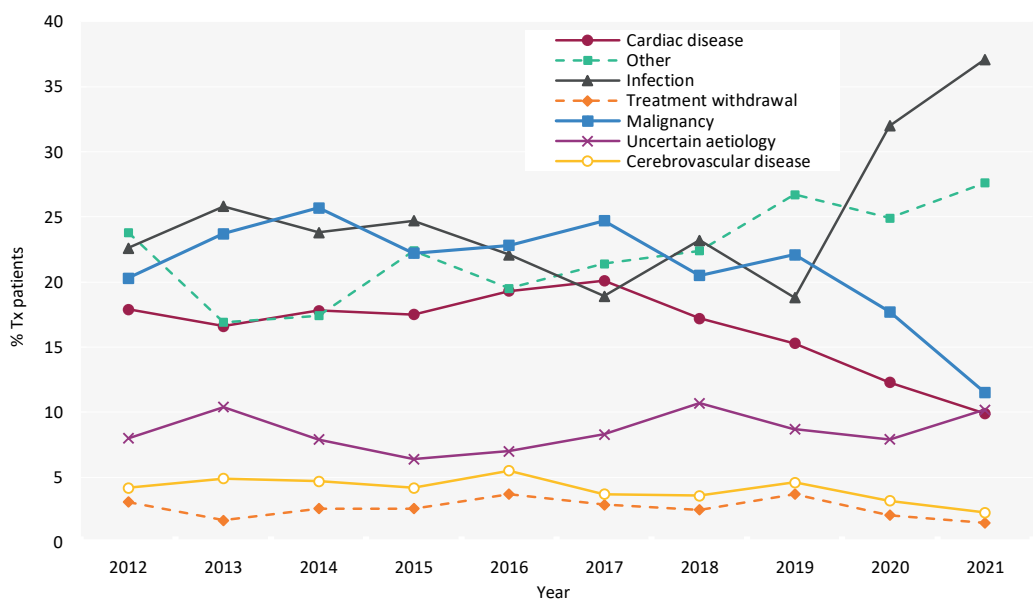


Figure 4.16 Cause of death between 2012 and 2021 for adult patients prevalent year