



CHAPTER 3

Mortality in Kidney Failure with Replacement Therapy

*Reporting the survival of patients on
kidney replacement therapy in Australia
and New Zealand and causes of death
in this population*

Contents

- Suggested Citation2
- Summary and Highlights3
- Survival.....4
- Cause of Death7
- Withdrawal from Kidney Replacement Therapy8
- References9

Suggested Citation

ANZDATA Registry. 44th Report, Chapter 3: Mortality in Kidney Failure with Replacement Therapy. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2021. Available at: <http://www.anzdata.org.au>

Summary and Highlights

Survival on kidney replacement therapy (KRT) varies widely according to the age at which a person commences therapy. For example, the median survival for patients aged 25-44 at the time of commencing dialysis in the period 2011-2020 was 8.8 years in Australia and 7.6 years in New Zealand, compared to 3.6 years and 3.0, respectively, for patients aged 75-84 at the time of starting dialysis.

The overall, unadjusted mortality rate per 100 patient years in 2020 was over five times greater for people on dialysis compared to those with a functioning transplant in both Australia and New Zealand, however, the differences between dialysis and transplant patients were less pronounced for older age groups. Similarly, the difference in mortality rate between dialysis patients and the general population narrowed with increasing patient age.

In Australia, the most common causes of death in people treated with kidney replacement therapy varied according to treatment modality at the time of death. Withdrawal from therapy was the most common cause of death in patients on haemodialysis, cardiovascular death was the most common in those on peritoneal dialysis and patients with a functioning transplant were most likely to pass away as a result of cancer. In New Zealand, 'other' cause of death was the most common reason documented across all groups.

Survival

Overall survival for patients who started kidney replacement therapy (KRT) in the period 2011-2020 is shown in figure 3.1 using the Kaplan-Meier method to calculate survival curves. Table 3.1 shows the survival at 1, 2 and 5 years for incident kidney replacement therapy patients by age group of the same period. These data are not censored at transplantation.

Figure 3.1.1 - Survival on Kidney Replacement Therapy - Australia 2011-2020

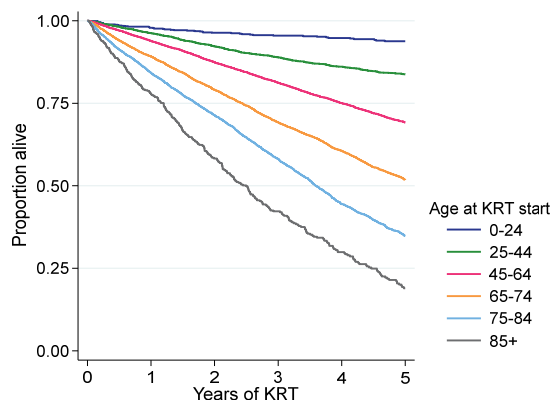


Figure 3.1.2 - Survival on Kidney Replacement Therapy - New Zealand 2011-2020

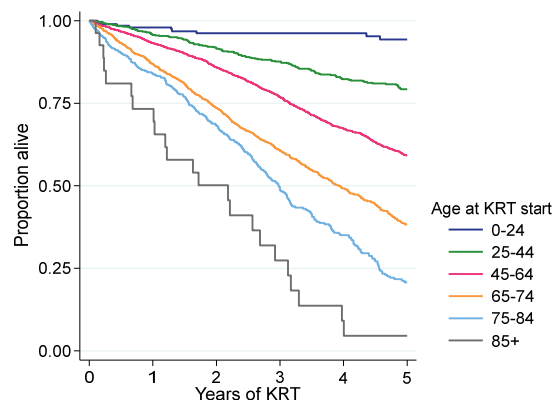


Table 3.1 Survival (95% CI) Among People Who Commenced Kidney Replacement Therapy 2011-2020

Age at KRT start	Years	Australia	New Zealand
0-24	1	98 (97, 99)	98 (95, 99)
	2	96 (95, 97)	96 (92, 98)
	5	94 (92, 95)	94 (89, 97)
25-44	1	96 (96, 97)	96 (94, 97)
	2	92 (91, 93)	92 (89, 93)
	5	84 (82, 85)	79 (76, 82)
45-64	1	94 (93, 94)	93 (92, 94)
	2	87 (87, 88)	86 (84, 87)
	5	69 (68, 70)	59 (57, 61)
65-74	1	89 (88, 90)	87 (85, 89)
	2	79 (78, 80)	74 (71, 76)
	5	52 (50, 53)	38 (35, 42)
75-84	1	84 (83, 85)	84 (80, 87)
	2	71 (70, 73)	68 (64, 73)
	5	35 (33, 37)	21 (16, 26)
85+	1	78 (74, 81)	73 (52, 86)
	2	58 (54, 62)	50 (30, 67)
	5	19 (15, 23)	5 (0, 19)

Unadjusted death rates for dialysis and transplantation during 2020 are shown in table 3.2 for various groups. This table includes all episodes of dialysis and transplantation (i.e. analyses are not censored at first transplant date), and deaths are attributed to the modality in use at the time of death. For this table, episodes of treatment include all people treated in 2020, regardless of year of first treatment.

Comparisons of mortality rates with the general population (stratified by gender) are shown in figures 3.2 and 3.3. Population and death estimates for Australia and New Zealand used for the calculation of mortality rates in this chapter were sourced from the Australian Bureau of Statistics (2020)^{1,2} and Stats NZ (2020)^{3,4}.

Table 3.2 Death Rates per 100 patient-years during Kidney Replacement Therapy - 2020

Category	Level	Dialysis			Transplant		
		Rate	Lower CI	Upper CI	Rate	Lower CI	Upper CI
Country	Australia	10.0	9.5	10.5	1.9	1.7	2.2
	New Zealand	11.0	9.8	12.3	1.9	1.3	2.5
Age	<25	2.3	0.9	5.1	0.0	0.0	0.5
	25-44	4.6	3.7	5.7	0.3	0.1	0.6
	45-64	8.3	7.6	9.0	1.2	1.0	1.5
	65-84	12.6	11.8	13.4	4.5	3.9	5.2
	85+	21.7	18.1	25.8	19.8	9.0	37.5
Diabetes status	Non-diabetic	7.7	7.1	8.4	1.4	1.2	1.7
	Type 1 diabetes	13.8	11.2	16.9	1.4	0.7	2.4
	Type 2 diabetes	12.0	11.3	12.8	3.3	2.8	4.0
Coronary disease	No	7.4	6.9	7.9	1.2	1.0	1.4
	Yes	13.9	13.0	14.8	4.4	3.7	5.2

Figure 3.2.1 - Prevalent Dialysis Mortality - Australian Patients vs General Population

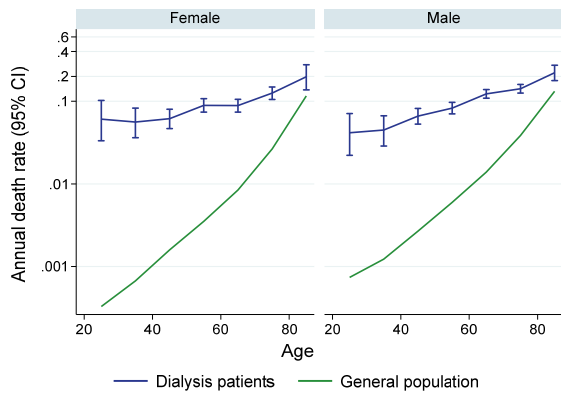


Figure 3.2.2 - Prevalent Transplant Mortality - Australian Patients vs General Population

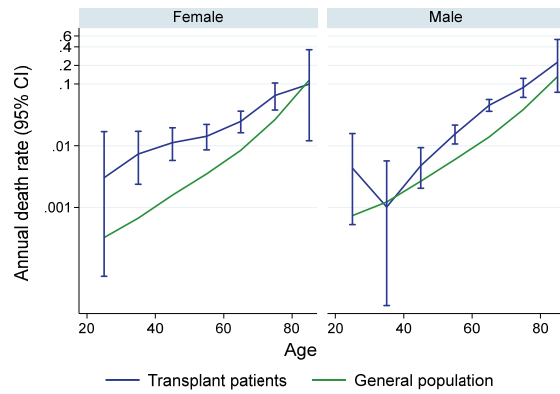


Figure 3.3.1 - Prevalent Dialysis Mortality - New Zealand Patients vs General Population

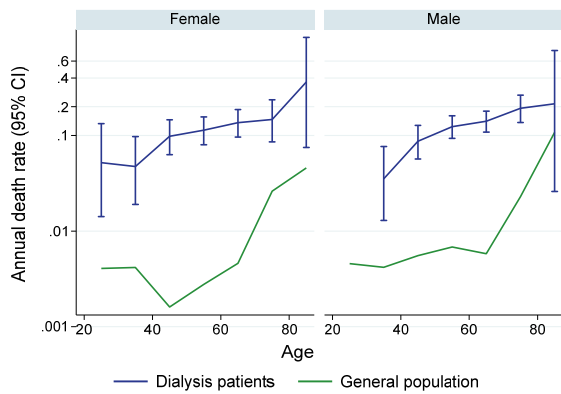
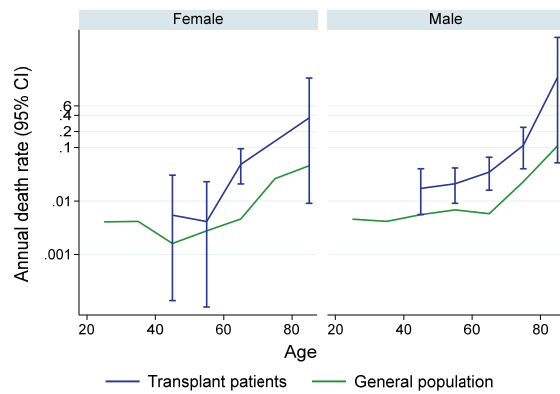


Figure 3.3.2 - Prevalent Transplant Mortality - New Zealand Patients vs General Population



The evolution of mortality rates over time is shown in figure 3.4. Note the different y axis scales in each graph.

Figure 3.4.1 - Dialysis Mortality Rates in Australia - 2011-2020

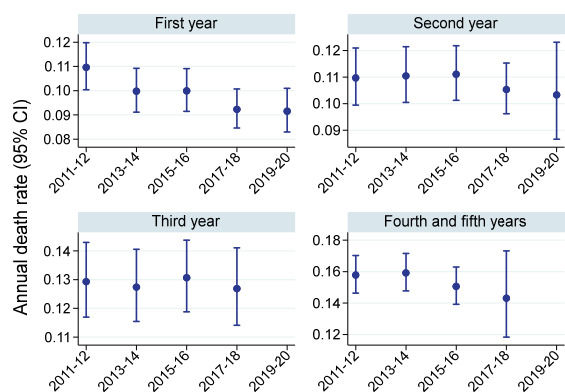
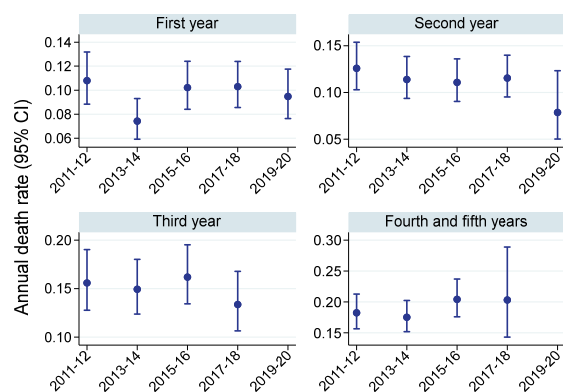


Figure 3.4.2 - Dialysis Mortality Rates in New Zealand - 2011-2020



Another perspective on survival during dialysis is presented in table 3.3. Median survival is the time to which 50% of people can expect to survive. Table 3.4 shows the median survival of older people who started dialysis treatment, by various categories. These survival data are censored at the time of transplantation and include those who started dialysis in the period 2011-2020. In addition to the median, the 25th and 75th centiles are included to give an indication of the range of observed survivals. Some figures are not observed - for example if half of a cohort have not yet died it is not possible to observe a median survival. These occurrences are indicated by * in the tables. The survival times amongst younger people are likely to be strongly affected by the selection bias (fitter people will be progressively transplanted and not be included in the analysis from that point).

Table 3.3 Median Survival on Dialysis by Age 2011-2020

Country	Age at start	Median (25th and 75th centiles), years
Australia	0-24	* (6.8, *)
	25-44	8.8 (4.9, *)
	45-64	6.4 (3.3, *)
	65-74	4.8 (2.3, 8.1)
	75-84	3.6 (1.7, 6.1)
	85+	2.5 (1.2, 4.5)
New Zealand	0-24	* (*, *)
	25-44	7.6 (4.8, *)
	45-64	5.2 (3.0, 7.9)
	65-74	3.7 (1.9, 6.4)
	75-84	3.0 (1.6, 4.6)
	85+	2.2 (0.7, 3.1)

Table 3.4 Survival on Dialysis by Age and Comorbidity Amongst Older People; Years (Median, 25th and 75th centiles) 2011-2020

Age at Start	Any Vascular Disease	Diabetes	Australia	New Zealand
65-69	No	No	6.7 (3.3, *)	5.6 (3.1, 9.6)
	No	Yes	5.5 (2.9, 8.2)	4.6 (2.4, 7.1)
	Yes	No	4.4 (1.6, 7.5)	4.3 (2.0, 9.0)
	Yes	Yes	4.3 (2.2, 6.9)	3.1 (1.5, 5.2)
70-74	No	No	6.4 (2.9, 9.7)	4.0 (1.9, 6.8)
	No	Yes	5.3 (2.6, 8.0)	4.3 (2.2, 6.4)
	Yes	No	4.2 (2.0, 8.3)	2.7 (1.5, 4.8)
	Yes	Yes	3.8 (1.8, 6.5)	3.1 (1.5, 5.5)
75-79	No	No	4.7 (2.6, 7.6)	3.7 (2.2, 5.7)
	No	Yes	4.3 (2.2, 6.7)	3.5 (2.6, 6.5)
	Yes	No	3.8 (1.8, 6.2)	3.0 (1.3, 4.6)
	Yes	Yes	3.3 (1.4, 5.6)	2.8 (1.4, 3.9)
80-84	No	No	3.6 (1.7, 5.9)	3.4 (1.4, 5.0)
	No	Yes	3.5 (1.7, 5.7)	2.4 (1.4, 4.7)
	Yes	No	3.4 (1.5, 5.9)	2.6 (1.5, 4.2)
	Yes	Yes	3.0 (1.3, 4.8)	1.9 (1.2, 5.3)
85+	No	No	3.2 (1.4, 4.9)	2.6 (1.0, 4.0)
	No	Yes	3.1 (1.5, 5.6)	1.0 (0.7, 1.6)
	Yes	No	2.3 (0.9, 4.1)	2.2 (0.7, 3.1)
	Yes	Yes	2.1 (1.1, 4.2)	1.7 (0.3, 2.7)

Cause of Death

The focus of this section is on deaths reported during 2020. The cause of death reported to ANZDATA is not necessarily the same as that reported on the death certificate⁵. ANZDATA specifically records a range of reasons for “withdrawal from treatment”. The cause of death in these instances is a person’s underlying renal failure, however, these data help to understand the reasons why individuals choose to cease kidney replacement therapy. This often relates to an underlying comorbidity and is further explored in table 3.6.

For the purposes of these analyses, deaths were attributed to the modality in use at the time of death (figure 3.5). Figure 3.6 and table 3.5 show the relationship between cause of death and age at death.

Figure 3.5 - Cause of Death by Modality - Deaths Occurring During 2020

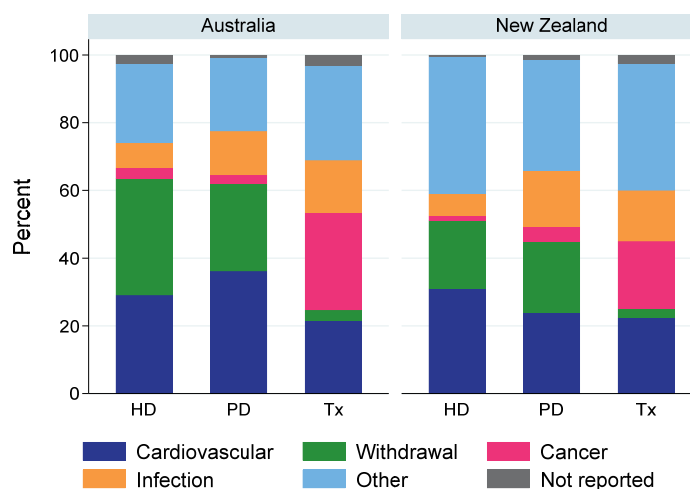


Figure 3.6 - Cause of Death by Modality and Age at Death - Deaths Occurring During 2020

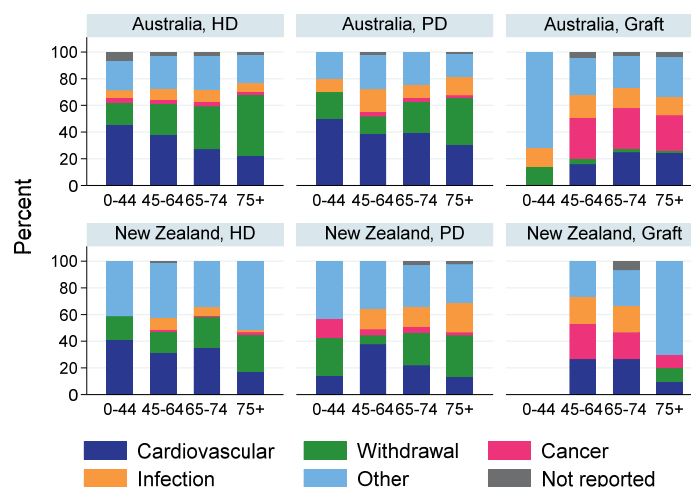


Table 3.5 Cause of Death by Modality and Age at Death - Deaths Occurring During 2020

Country	Cause of Death	Haemodialysis					Peritoneal Dialysis					Graft				
		0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total
Australia	Cardiovascular	35	169	123	158	485	5	21	39	33	98	0	12	28	14	54
	Withdrawal	13	102	145	315	575	2	7	23	38	70	1	3	3	1	8
	Cancer	3	14	15	19	51	0	2	3	2	7	0	23	34	15	72
	Infection	4	35	41	43	123	1	9	10	15	35	1	13	17	8	39
	Other	17	110	114	149	390	2	14	24	19	59	5	21	27	17	70
	Not reported	5	12	13	13	43	0	1	0	1	2	0	3	3	2	8
	Total	77	442	451	697	1667	10	54	99	108	271	7	75	112	57	251
New Zealand	Cardiovascular	7	38	33	8	86	1	17	9	6	33	0	4	4	1	9
	Withdrawal	3	19	21	13	56	2	3	10	14	29	0	0	0	1	1
	Cancer	0	2	1	1	4	1	2	2	1	6	0	4	3	1	8
	Infection	0	11	6	1	18	0	7	6	10	23	0	3	3	0	6
	Other	7	50	32	24	113	3	16	13	13	45	0	4	4	7	15
	Not reported	0	1	0	0	1	0	0	1	1	2	0	0	1	0	1
	Total	17	121	93	47	278	7	45	41	45	138	0	15	15	10	40

Withdrawal from Kidney Replacement Therapy

During 2020 there were 653 deaths in Australia and 86 in New Zealand attributed to withdrawal from kidney replacement therapy (table 3.6). The vast majority of these were among patients receiving dialysis therapy. “Psychosocial” reasons were the most commonly cited reasons for withdrawal. However, the coding of these categories is clearly somewhat subjective. Table 3.7 shows a breakdown of patients who withdrew and died in 2020 by age and duration of KRT. In 2020, ANZDATA commenced collection of the date of withdrawal from treatment for dialysis patients.

Table 3.6 Reason for Withdrawal from Kidney Replacement Therapy - 2020

Country	Reason for withdrawal	HD	PD	Graft
Australia	Withdrawal-Psycho Social Reasons	202	29	1
	Patient Refused Treatment (Specify)	17	1	2
	Withdrawal-Cardiovascular Comorbid Conditions	151	17	0
	Withdrawal-Cerebrovascular Comorbid Conditions	34	8	1
	Withdrawal-Peripheral Vascular Comorbid Conditions	46	5	1
	Withdrawal-Malignancy	105	7	3
	Withdrawal-Dialysis Access Difficulties	20	3	0
New Zealand	Withdrawal-Psycho Social Reasons	6	8	1
	Patient Refused Treatment (Specify)	0	2	0
	Withdrawal-Cardiovascular Comorbid Conditions	27	8	0
	Withdrawal-Cerebrovascular Comorbid Conditions	4	3	0
	Withdrawal-Peripheral Vascular Comorbid Conditions	9	5	0
	Withdrawal-Malignancy	7	2	0
	Withdrawal-Dialysis Access Difficulties	3	1	0

Table 3.7 Time from Kidney Replacement Therapy Start to Death, in Patients Who Withdrew and Died in 2020

Time from first KRT (years)	Australia					New Zealand				
	0-44	45-54	65-74	75+	Total	0-44	45-54	65-74	75+	Total
<1 year	5	15	24	40	84	1	3	3	2	9
1-2 years	2	18	25	37	82	0	4	6	6	16
2-5 years	4	36	56	99	195	1	4	11	9	25
5+ years	5	43	66	178	292	3	11	11	11	36
Total	16	112	171	354	653	5	22	31	28	86

References

¹ Australian Bureau of Statistics, 2020, Australian Demographic Statistics, Jun 2020, time series spreadsheets, cat. no. 3101.0, viewed 4 Jan 2021,

<http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/3101.0Jun%202020?OpenDocument>

² Australian Bureau of Statistics, 2020, Deaths, Australia 2020, viewed 30 Sep 2021,

<https://www.abs.gov.au/statistics/people/population/deaths-australia/2019>

³ This work is based on/includes Stats NZ's data which are licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence. Stats NZ, 2020, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 4 Jan 2021, <http://archive.stats.govt.nz/infoshare/>

⁴ This work is based on/includes Stats NZ's data which are licensed by Stats NZ for re-use under the Creative Commons Attribution 4.0 International licence. Stats NZ, 2020, Deaths by Age and Sex (Annual-Dec), NZ Infoshare, viewed 30 Sep 2021, <http://archive.stats.govt.nz/infoshare/>

⁵ Sypek MP, Dansie KB, Clayton P, Webster AC, McDonald S. Comparison of cause of death between ANZDATA and the Australian National Death Index. *Nephrology*. 2018 Mar 1. doi: 10.1111/nep.13250.