

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

| | |
|--|----|
| Summary and Highlights | 3 |
| Suggested Citation | 3 |
| Survival | 4 |
| Death Rates | 5 |
| Median Survival | 7 |
| Cause of Death | 8 |
| Withdrawal from Kidney Replacement Therapy | 10 |
| References | 11 |

SUMMARY AND HIGHLIGHTS

People on Kidney Replacement Therapy (KRT) continue to have an overall higher unadjusted mortality rate compared to the general population, with the gap in mortality rate greatest in younger people on KRT. The difference in mortality with the general population is smaller in transplant recipients than in patients on dialysis. Dialysis mortality rates have remained relatively unchanged over the past 10 years.

The most frequent cause of death is different based on KRT modality. For people on dialysis, the most common causes of death were cardiovascular disease and withdrawal from dialysis in 2023. For people with a kidney transplant, cardiovascular disease and cancer were the most common causes of death.

The most common reason for withdrawal from KRT was psychosocial, followed by cardiovascular and peripheral vascular comorbidity. The highest number of people with death from withdrawal from KRT was seen in people who have been on KRT for a longer period of time (over 5 years).

SUGGESTED CITATION

E Au, C Davies, S Bateman, J Chen, P Clayton, K Hurst, F Kholmurodova, D Lee, H McCarthy, S McDonald, W Mulley, M Roberts, B Solomon, T Sun, G Irish. 47th Report, Chapter 3: Mortality in Kidney Failure with Replacement Therapy. Australia and New Zealand Dialysis and Transplant Registry, Adelaide, Australia. 2024. Available at: <http://www.anzdata.org.au>

SURVIVAL

Overall survival for patients who started kidney replacement therapy (KRT) in the period 2014-2023 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 2014-2023

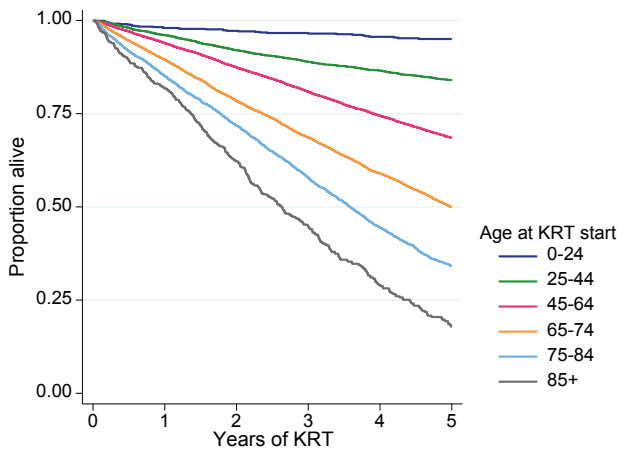


Figure 3.1.2
Survival on Kidney Replacement Therapy - New Zealand 2014-2023

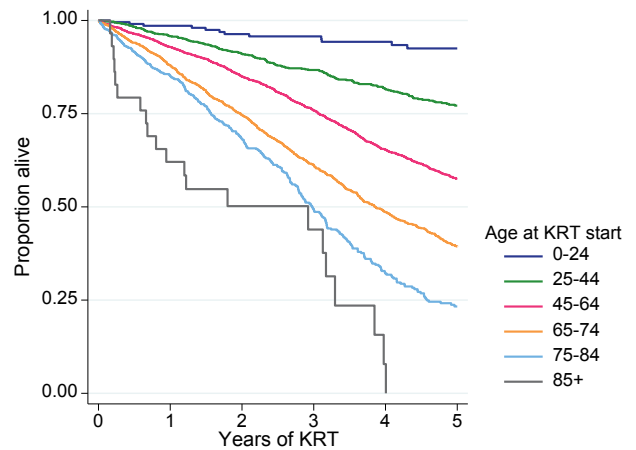


Table 3.1
Survival [95% CI] Among People Who Commenced Kidney Replacement Therapy 2014-2023

| Age at KRT start | Years | Australia | New Zealand |
|------------------|-------|-------------|--------------|
| 0-24 | 1 | 98 [97, 99] | 99 [96, 100] |
| | 2 | 97 [96, 98] | 96 [92, 98] |
| | 5 | 95 [93, 96] | 92 [87, 96] |
| 25-44 | 1 | 96 [95, 97] | 96 [94, 97] |
| | 2 | 92 [91, 93] | 91 [89, 93] |
| | 5 | 84 [83, 85] | 77 [74, 80] |
| 45-64 | 1 | 94 [93, 94] | 93 [92, 94] |
| | 2 | 87 [87, 88] | 85 [84, 86] |
| | 5 | 69 [67, 70] | 58 [55, 60] |
| 65-74 | 1 | 89 [89, 90] | 88 [86, 90] |
| | 2 | 78 [77, 79] | 75 [72, 77] |
| | 5 | 50 [49, 51] | 39 [36, 42] |
| 75-84 | 1 | 85 [84, 86] | 85 [82, 88] |
| | 2 | 72 [70, 73] | 68 [64, 72] |
| | 5 | 34 [33, 36] | 23 [19, 28] |
| 85+ | 1 | 82 [78, 85] | 62 [42, 77] |
| | 2 | 62 [58, 66] | 50 [31, 67] |
| | 5 | 18 [14, 22] | - |

DEATH RATES

Unadjusted death rates for dialysis and transplantation during 2023 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 2023, 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. Transplant survival is described in more detail in the Kidney Transplantation chapter of the Report.

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 (2023)^{1,2} and Stats NZ (2023)^{3,4}.

Table 3.2
Death Rates [95% CI] per 100 patient-years during Kidney Replacement Therapy - 2023

| Category | Level | Dialysis | Transplant |
|------------------|-----------------|-------------------|------------------|
| Country | Australia | 9.4 [8.9, 9.9] | 3.2 [2.9, 3.5] |
| | New Zealand | 11.9 [10.8, 13.2] | 3.3 [2.6, 4.1] |
| Age | <25 | 1.1 [0.2, 3.1] | 0.0 [0.0, 0.6] |
| | 25-44 | 4.5 [3.7, 5.4] | 0.4 [0.2, 0.7] |
| | 45-64 | 8.2 [7.5, 8.9] | 1.9 [1.6, 2.2] |
| | 65-84 | 12.4 [11.7, 13.2] | 7.6 [6.8, 8.5] |
| | 85+ | 17.8 [14.7, 21.3] | 17.9 [9.3, 31.3] |
| Diabetes status | Non-diabetic | 7.2 [6.6, 7.8] | 2.3 [2.1, 2.6] |
| | Type 1 diabetes | 11.9 [9.6, 14.6] | 3.5 [2.4, 4.9] |
| | Type 2 diabetes | 12.0 [11.3, 12.8] | 5.5 [4.8, 6.3] |
| Coronary disease | No | 7.0 [6.5, 7.5] | 2.3 [2.0, 2.6] |
| | Yes | 14.1 [13.3, 15.0] | 6.7 [5.8, 7.6] |

Figure 3.2.1
Prevalent Dialysis Mortality 2023 - Australian Patients vs General Population

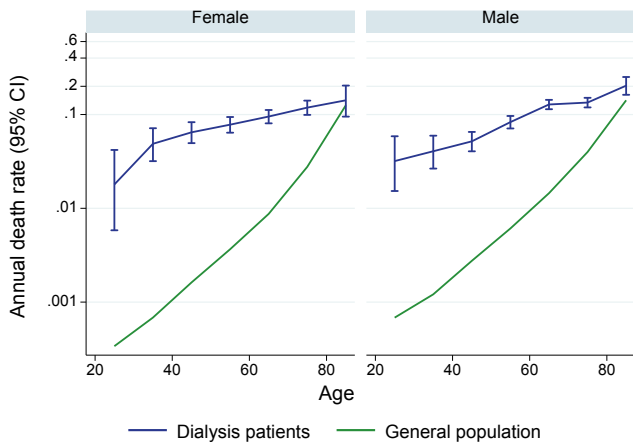


Figure 3.2.2
Prevalent Transplant Mortality 2023 - Australian Patients vs General Population

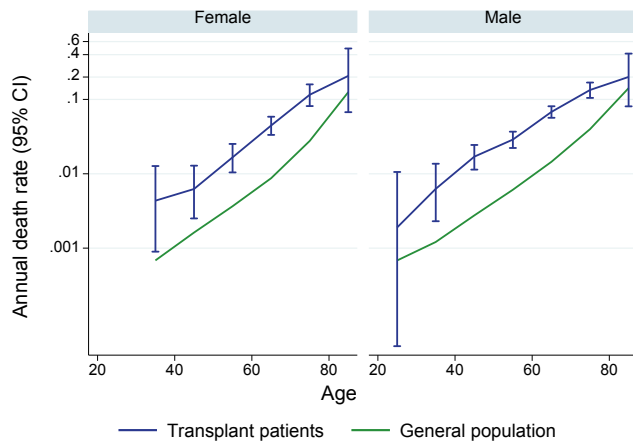


Figure 3.3.1
Prevalent Dialysis Mortality 2023 - New Zealand Patients vs General Population

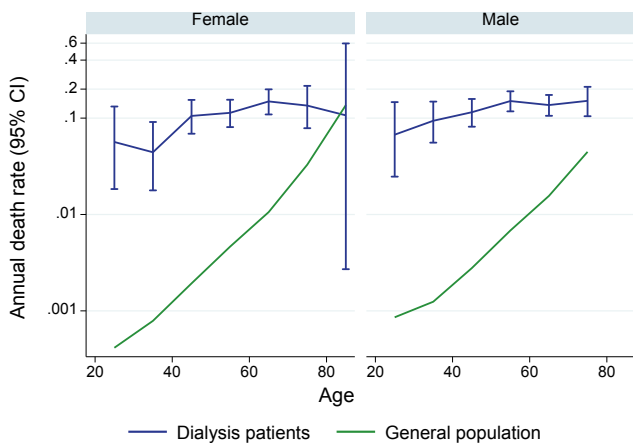
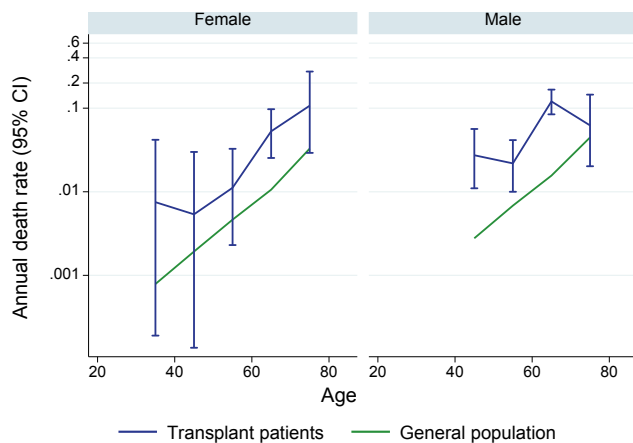


Figure 3.3.2
Prevalent Transplant Mortality 2023 - New Zealand Patients vs General Population



The evolution of dialysis mortality rates over time is shown in Figure 3.4.

Figure 3.4.1
Dialysis Mortality Rates in Australia - 2014-2023

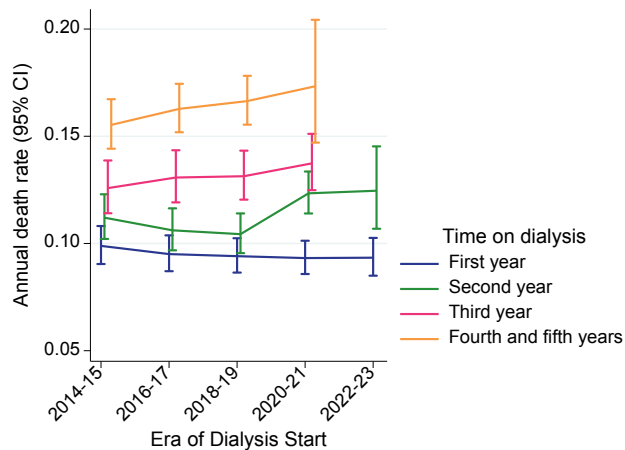
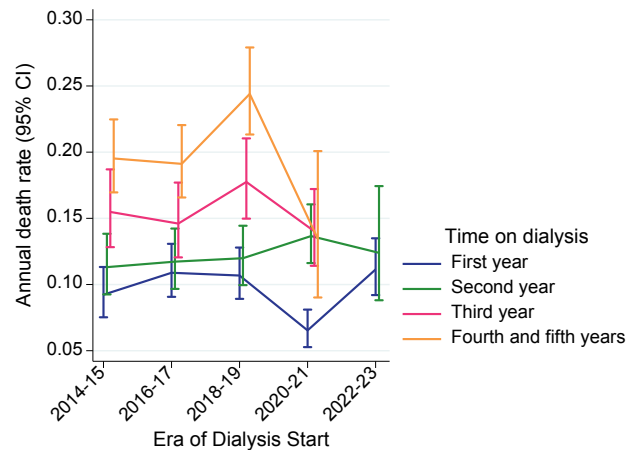


Figure 3.4.2
Dialysis Mortality Rates in New Zealand - 2014-2023



[BACK TO CONTENTS](#)

MEDIAN SURVIVAL

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. Median survival is not presented for transplant recipients as it is not possible to estimate due to the low mortality rates. 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 2014-2023. 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
2014-2023

| Country | Age at start | Median (25th and 75th centiles), years |
|-------------|--------------|--|
| Australia | 0-24 | *(*,*) |
| | 25-44 | *(5.2,*) |
| | 45-64 | 6.3 (3.3, *) |
| | 65-74 | 4.6 (2.2, 7.4) |
| | 75-84 | 3.6 (1.8, 6.1) |
| | 85+ | 2.6 (1.4, 4.4) |
| New Zealand | 0-24 | *(8.3,*) |
| | 25-44 | 7.8 (4.2, *) |
| | 45-64 | 4.9 (2.8, 8.0) |
| | 65-74 | 3.6 (1.9, 6.3) |
| | 75-84 | 3.0 (1.6, 4.6) |
| | 85+ | 2.9 (0.7, 3.3) |

Table 3.4
Survival on Dialysis by Age and Comorbidity Amongst
Older People; Years (Median, 25th and 75th centiles)
2014-2023

| Age at Start | Any Vascular Disease | Diabetes | Australia | New Zealand |
|--------------|----------------------|----------|----------------|----------------|
| 65-69 | No | No | 5.8 (3.3, 8.8) | 5.9 (3.1, 8.2) |
| | No | Yes | 5.0 (2.7, 8.3) | 4.5 (2.3, 7.4) |
| | Yes | No | 4.6 (1.9, 7.1) | 3.8 (1.5, 7.2) |
| | Yes | Yes | 4.0 (2.0, 6.6) | 3.2 (1.5, 5.4) |
| 70-74 | No | No | 5.7 (3.1, 9.1) | 3.7 (2.1, 6.2) |
| | No | Yes | 5.1 (2.7, 8.1) | 4.8 (2.7, 7.7) |
| | Yes | No | 4.2 (2.0, 7.2) | 2.8 (1.5, 5.1) |
| 75-79 | Yes | Yes | 3.6 (1.7, 6.2) | 3.0 (1.4, 5.5) |
| | No | No | 4.5 (2.6, 7.6) | 3.2 (2.0, 4.5) |
| | No | Yes | 4.5 (2.3, 7.5) | 3.7 (2.7, 6.4) |
| 80-84 | Yes | No | 3.4 (1.7, 6.7) | 2.6 (1.2, 4.6) |
| | Yes | Yes | 3.1 (1.5, 5.2) | 2.8 (1.3, 4.0) |
| | No | No | 3.7 (1.9, 6.3) | 3.4 (1.7, 5.3) |
| 85+ | No | Yes | 3.7 (1.9, 5.6) | 3.2 (1.4, 6.5) |
| | Yes | No | 3.2 (1.5, 5.6) | 2.4 (1.4, 3.9) |
| | Yes | Yes | 3.0 (1.4, 4.7) | 1.9 (1.2, 5.3) |
| 85+ | No | No | 3.0 (1.8, 4.5) | 1.8 (0.2, 4.0) |
| | No | Yes | 3.2 (1.8, 5.4) | 4.0 (0.7, 4.0) |
| | Yes | No | 2.3 (1.1, 4.2) | 1.2 (0.7, 3.1) |
| | Yes | Yes | 2.5 (1.4, 4.0) | 3.8 (0.3, 3.8) |

[BACK TO CONTENTS](#)

CAUSE OF DEATH

The focus of this section is on deaths reported during 2023. 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 kidney 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 2023

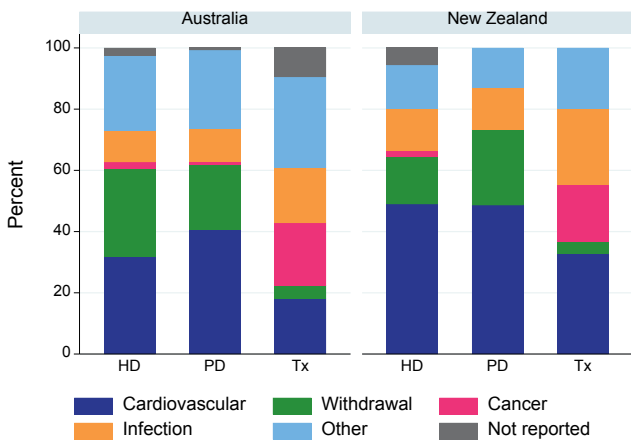


Figure 3.6
Cause of Death by Modality and Age at Death - Deaths Occurring During 2023

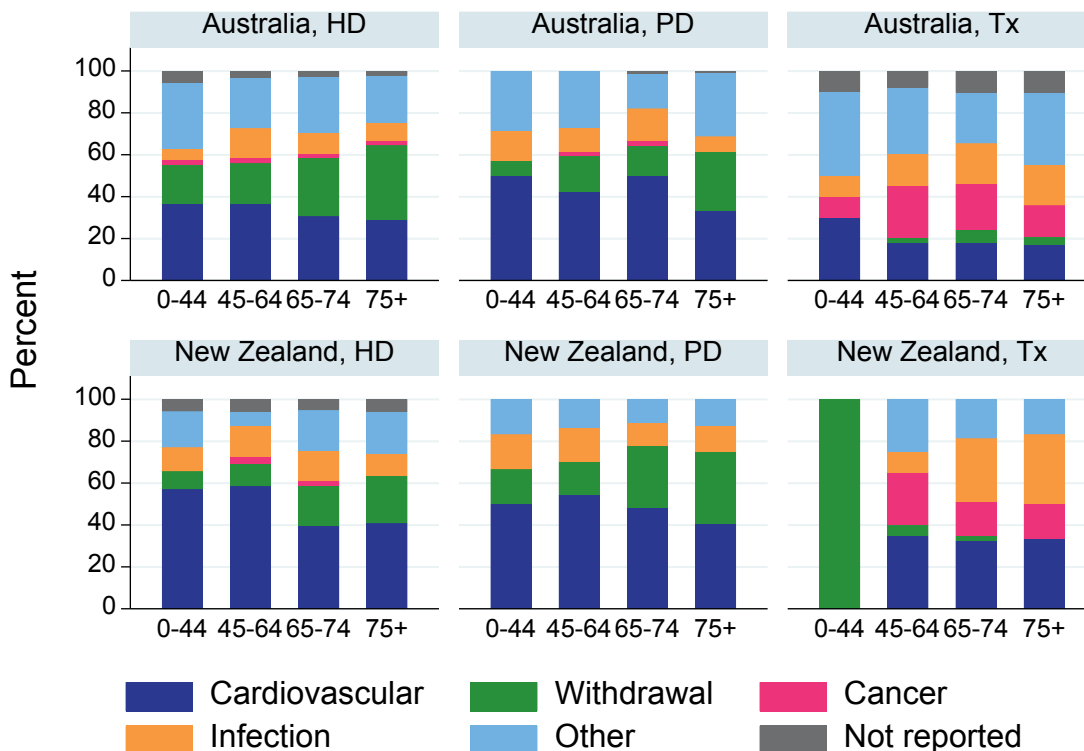


Table 3.5
Cause of Death by Modality and Age at Death - Deaths Occurring During 2023

| Country | Cause of Death | Haemodialysis | | | | | Peritoneal Dialysis | | | | | Transplant | | | | |
|-------------|----------------|---------------|------------|------------|------------|-------------|---------------------|-----------|-----------|------------|------------|------------|------------|------------|------------|------------|
| | | 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 | 28 | 178 | 176 | 256 | 638 | 7 | 22 | 42 | 46 | 117 | 3 | 21 | 32 | 22 | 78 |
| | Withdrawal | 14 | 94 | 160 | 309 | 577 | 1 | 9 | 12 | 39 | 61 | 0 | 3 | 11 | 5 | 19 |
| | Cancer | 2 | 13 | 11 | 18 | 44 | 0 | 1 | 2 | 0 | 3 | 1 | 29 | 39 | 19 | 88 |
| | Infection | 4 | 68 | 58 | 77 | 207 | 2 | 6 | 13 | 10 | 31 | 1 | 18 | 34 | 25 | 78 |
| | Other | 24 | 117 | 153 | 197 | 491 | 4 | 14 | 14 | 42 | 74 | 4 | 37 | 43 | 44 | 128 |
| | Not reported | 4 | 15 | 14 | 17 | 50 | 0 | 0 | 1 | 1 | 2 | 1 | 9 | 18 | 13 | 41 |
| | Total | 76 | 485 | 572 | 874 | 2007 | 14 | 52 | 84 | 138 | 288 | 10 | 117 | 177 | 128 | 432 |
| New Zealand | Cardiovascular | 20 | 92 | 54 | 27 | 193 | 3 | 24 | 13 | 13 | 53 | 0 | 7 | 14 | 4 | 25 |
| | Withdrawal | 3 | 17 | 26 | 15 | 61 | 1 | 7 | 8 | 11 | 27 | 1 | 1 | 1 | 0 | 3 |
| | Cancer | 0 | 5 | 3 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 7 | 2 | 14 |
| | Infection | 4 | 23 | 20 | 7 | 54 | 1 | 7 | 3 | 4 | 15 | 0 | 2 | 13 | 4 | 19 |
| | Other | 6 | 11 | 26 | 13 | 56 | 1 | 6 | 3 | 4 | 14 | 0 | 5 | 8 | 2 | 15 |
| | Not reported | 2 | 9 | 7 | 4 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total | 35 | 157 | 136 | 66 | 394 | 6 | 44 | 27 | 32 | 109 | 1 | 20 | 43 | 12 | 76 |

WITHDRAWAL FROM KIDNEY REPLACEMENT THERAPY

During 2023 there were 657 deaths in Australia and 91 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 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 2023 by age and duration of KRT.

Table 3.6
Reason for Withdrawal from Kidney Replacement Therapy - 2023

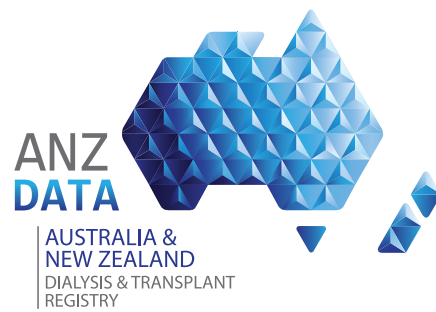
| Country | Reason for withdrawal | HD | PD | Tx |
|-------------|---------------------------------|-----|----|----|
| Australia | Psychosocial | 204 | 27 | 7 |
| | Declined further treatment | 22 | 1 | 0 |
| | Cardiovascular comorbidity | 162 | 15 | 2 |
| | Cerebrovascular comorbidity | 46 | 4 | 2 |
| | Peripheral vascular comorbidity | 42 | 7 | 1 |
| | Malignancy | 75 | 7 | 7 |
| | Dialysis access difficulties | 26 | 0 | 0 |
| New Zealand | Psychosocial | 11 | 7 | 0 |
| | Declined further treatment | 1 | 1 | 0 |
| | Cardiovascular comorbidity | 16 | 7 | 1 |
| | Cerebrovascular comorbidity | 6 | 0 | 0 |
| | Peripheral vascular comorbidity | 17 | 5 | 1 |
| | Malignancy | 6 | 5 | 1 |
| | Dialysis access difficulties | 4 | 2 | 0 |

Table 3.6
Reason for Withdrawal from Kidney Replacement Therapy - 2023

| 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 | 3 | 19 | 27 | 29 | 78 | 0 | 4 | 10 | 3 | 17 |
| 1-2 years | 2 | 20 | 22 | 47 | 91 | 1 | 3 | 4 | 0 | 8 |
| 2-5 years | 4 | 27 | 58 | 112 | 201 | 1 | 4 | 5 | 9 | 19 |
| 5+ years | 6 | 40 | 76 | 165 | 287 | 3 | 14 | 16 | 14 | 47 |
| Total | 15 | 106 | 183 | 353 | 657 | 5 | 25 | 35 | 26 | 91 |

REFERENCES

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2. Australian Bureau of Statistics, 2023, Deaths, Australia 2023, viewed 25 Oct 2024, <https://www.abs.gov.au/statistics/people/population/deaths-australia/2023>
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, 2023, Estimated Resident Population by Age and Sex (1991+) (Annual-Jun), NZ Infoshare, viewed 14 Dec 2023, <http://infoshare.stats.govt.nz/>
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, 2023, Deaths by Age and Sex (Annual-Dec), NZ Infoshare, viewed 25 Oct 2024, <http://infoshare.stats.govt.nz/>
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.



CHAPTER 3

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