

## **CHAPTER 3**

### **DEATHS**

**Stephen McDonald**  
**Leonie Excell**  
**Brian Livingston**

## INTRODUCTION

### AUSTRALIA

#### DIALYSIS DEPENDENT

The total number of deaths was 1,482 (15.0 deaths per 100 patient years at risk) in 2008 among dialysis dependent patients.

For those treated with peritoneal dialysis, 243 deaths occurred (13.5 deaths per 100 patient years at risk) and for haemodialysis there were 1189 deaths (15.4 deaths per 100 patient years at risk) (Figure 3.9).

The death rate for each State/Territory per 100 patient years at risk is shown in Figures 3.1 and 3.2. These figures are crude (not adjusted for age or comorbidity). It can be seen death rates have been largely stable for several years.

#### FUNCTIONING TRANSPLANT

There were 167 deaths (2.3 deaths per 100 patient years at risk) of patients with a functioning transplant among recipients of deceased donor grafts.

Among recipients of deceased donor grafts the death rate was 130 deaths (2.8 per 100 patient years) and the live donor recipient death rate 37 deaths (1.4 per 100 patient years).

Figure 3.3 shows the age specific mortality rates for patients treated with dialysis or transplantation relative to the Australian population rates for 2008.

The death rate in relation to age is shown in Figure 3.10.

### NEW ZEALAND

#### DIALYSIS DEPENDENT

There were 356 deaths (16.9 deaths per 100 patient years at risk) in 2008.

For those treated with peritoneal dialysis, 123 deaths occurred (16.2 deaths per 100 patient years at risk) and for haemodialysis there were 233 deaths (17.4 deaths per 100 patient years at risk) shown in Figure 3.11.

#### FUNCTIONING TRANSPLANT

There were 26 deaths (2.0 deaths per 100 patient years at risk) in 2008.

The mortality rate for recipients of deceased donor kidneys was 20 deaths (2.5 per 100 patient years) and live donor recipients six deaths (1.2 per 100 patient years) shown in Figure 3.12.

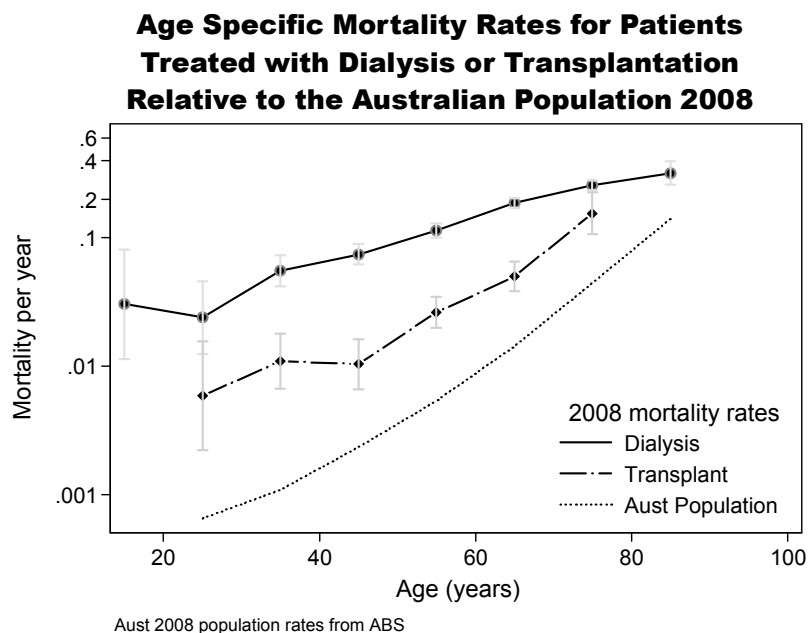
See Appendix III at the Website ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm))

**Figure 3.1**

| <b>Death Rates by States 1998 - 2008</b><br><b>All Dialysis Patients (per 100 patient years)</b> |      |      |      |      |      |      |      |      |      |      |
|--|------|------|------|------|------|------|------|------|------|------|
| Year   | QLD  | NSW  | ACT  | VIC  | TAS  | SA   | NT   | WA   | Aust | NZ   |
| 1998   | 19.3 | 16.9 | 15.3 | 15.8 | 25.9 | 15.7 | 15.8 | 13.6 | 16.7 | 16.6 |
| 1999   | 20.7 | 16.0 | 14.7 | 14.1 | 23.9 | 15.2 | 17.6 | 17.3 | 16.5 | 16.4 |
| 2000   | 16.9 | 16.5 | 13.5 | 14.0 | 14.7 | 14.3 | 20.0 | 16.3 | 15.7 | 19.2 |
| 2001   | 18.6 | 15.3 | 14.2 | 14.3 | 23.4 | 14.3 | 15.0 | 21.9 | 16.2 | 18.6 |
| 2002   | 17.4 | 15.1 | 11.4 | 13.6 | 12.0 | 12.3 | 14.8 | 16.6 | 14.9 | 15.2 |
| 2003   | 17.0 | 14.0 | 9.0  | 14.9 | 20.7 | 14.1 | 15.1 | 15.9 | 15.0 | 15.8 |
| 2004   | 16.3 | 16.1 | 11.6 | 15.0 | 18.1 | 16.2 | 15.2 | 12.4 | 15.4 | 17.3 |
| 2005   | 14.7 | 14.3 | 12.3 | 13.4 | 16.9 | 13.6 | 14.4 | 17.4 | 14.4 | 16.5 |
| 2006   | 18.0 | 13.7 | 11.2 | 13.2 | 13.9 | 13.9 | 15.9 | 17.4 | 14.8 | 17.3 |
| 2007   | 16.1 | 14.7 | 14.6 | 15.4 | 18.6 | 14.5 | 10.7 | 18.1 | 15.4 | 14.5 |
| 2008   | 18.5 | 14.2 | 15.9 | 12.7 | 16.6 | 16.4 | 14.6 | 15.5 | 15.0 | 16.9 |

**Figure 3.2**

| <b>Death Rates by States</b><br><b>Dialysis Modality and Age Groups 2008</b><br><b>(per 100 patient years)</b> |                 |      |      |      |      |      |      |      |      |      |      |
|--|-----------------|------|------|------|------|------|------|------|------|------|------|
| Age Group  | Treatment       | QLD  | NSW  | ACT  | VIC  | TAS  | SA   | NT   | WA   | Aust | NZ   |
| 45-64 years  | All Dx Patients | 12.0 | 8.6  | 5.4  | 8.3  | 6.6  | 11.8 | 11.9 | 11.8 | 9.7  | 12.8 |
|  | PD              | 11.1 | 7.9  | 9.6  | 7.6  | 12.0 | 10.0 | 10.4 | 8.5  | 8.8  | 9.9  |
|  | HD              | 12.3 | 8.9  | 4.8  | 8.4  | 5.1  | 12.3 | 12.0 | 12.7 | 10.0 | 14.4 |
| 65-84 years  | All Dx Patients | 26.5 | 20.5 | 28.4 | 18.3 | 25.8 | 20.4 | 32.6 | 21.9 | 21.5 | 27.6 |
|  | PD              | 27.3 | 17.3 | 10.8 | 18.9 | 13.9 | 20.7 | 15.5 | 25.5 | 20.2 | 28.8 |
|  | HD              | 26.3 | 21.7 | 32.1 | 18.2 | 31.1 | 20.3 | 35.2 | 20.8 | 21.9 | 26.8 |

**Figure 3.3**




## CAUSE OF DEATHS

### AUSTRALIA

#### DIALYSIS DEPENDENT

The most common causes of death were “social causes” (37%), followed by cardiac (34%), infection (11%), miscellaneous (10%) and vascular (8%).

Of the withdrawal of treatment from “social” causes, most were withdrawal related to psychosocial causes, followed by malignancy, cardiovascular, peripheral vascular, cerebrovascular and access problems. Thirty percent were diabetics. There were three patients < 40 years of age (the youngest 25 years of age) and 162 patients were ≥ 80 years of age; the oldest was 95 years. Myocardial infarction (17%) and “cardiac arrest” (15%) formed the majority of the cardiac group.

The site of infection was most commonly reported as “septicaemia”, followed by lung, peritoneum, wound and infection in other sites.

The details of the site and identity of the organisms can be found at the Website ([www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm](http://www.anzdata.org.au/ANZDATA/AnzdataReport/download.htm)).

There were 92 patients (6%) who died from malignancy compared to 68 patients in 2007. A further 105 patients (7%) withdrew from dialysis due to malignancy.

#### FUNCTIONING TRANSPLANT

Among those with a functioning transplant, malignancy was the most common cause of death (31%), followed by cardiac (27%), then infection (17%), vascular (7%) and “social causes” (6%).

### DEATHS OF YOUNG ADULTS

#### 15-24 YEARS OF AGE

There were four deaths in the age group 15-24 years; three males and one female; two of the males were indigenous. There were two hospital and one satellite haemodialysis dependent and one having home automated peritoneal dialysis. Two died from cardiac causes, one from vascular and the home peritoneal dialysis patient from peritonitis.

#### 25-34 YEARS OF AGE

There were 13 deaths in this age group; seven males and six females. Four died with a functioning transplant. Eight were treated with haemodialysis (six hospital, one satellite and one home haemodialysis) and one on home automated peritoneal dialysis. Two of the dialysis patients had previous failed transplants.

Causes of death were: cardiac, six (including three hospital, one satellite, one home haemodialysis and one home automated peritoneal dialysis); one due to myasthenia gravis, one malignancy and one withdrawal (all hospital haemodialysis dependent).

#### 25-34 YEARS OF AGE (Continued)

Of the functioning transplant deaths, three were from malignancies and one due to suicide.

There were four Type 1 diabetics amongst this group.

### NEW ZEALAND

#### DIALYSIS DEPENDENT

Cardiac events comprised the most common cause of death (41%). Other causes were “social” (20%), infection (18%), miscellaneous (14%) and vascular (7%).

Treatment withdrawal was reported in 70 patients (20%). Twenty three percent were diabetics. There was only one patient under 40 years of age; the youngest was 32 years and there were 19 patients ≥ 80 years of age; the oldest was 90 years.

There were 25 patients (7%) who died from malignancy compared to 18 patients (6%) in 2007. A further 13 patients (4%) withdrew from dialysis in 2008 due to malignancy.

#### FUNCTIONING TRANSPLANT

Amongst the 26 deaths of patients with a functioning transplant, the causes were malignancy and cardiac both (31%) and infection (19%). There were no deaths from vascular or “social causes”.

### DEATHS OF YOUNG ADULTS

#### 15-24 YEARS OF AGE

Two patients between 15-24 years of age died; both were caucasoid; one male and one female. One was hospital haemodialysis dependent and died from perforation of abdominal viscus and the other was a failed second transplant refusing to return to dialysis. The youngest was 19 years of age.

#### 25-34 YEARS OF AGE

Nine patients between 25-34 years of age died: five females and four males. Four were Caucasoid, four Maori and one a Pacific Person. All were dialysis dependent.

Two were from cardiac causes (one home CAPD and one hospital haemodialysis), two from infection (both hospital haemodialysis), two unknown causes (one hospital and one satellite haemodialysis), one withdrew due to psychosocial causes (hospital haemodialysis), one due to a CVA (home CAPD) and one calciphylaxis (home automated peritoneal dialysis).

Two dialysis patients had previously been transplanted. There was one Type 1 diabetic and one Type 2 insulin requiring diabetic amongst this group.

**Figure 3.4**

**Cause of Death by RRT Modality 1-Jan-2008 to 31-Dec-2008**

| Cause of Death            |                                    | Australia        |                 | New Zealand      |                 |
|---------------------------|------------------------------------|------------------|-----------------|------------------|-----------------|
|                           |                                    | Dialysis         | Transplant      | Dialysis         | Transplant      |
| <b>Cardiac</b>            | Cardiac arrest                     | 223              | 16              | 40               | 3               |
|                           | Hyperkalaemia                      | 4                | 1               | -                | -               |
|                           | Hypertensive cardiac failure       | 3                | -               | 1                | 1               |
|                           | Myocardial infarction              | 116              | 9               | 30               | 1               |
|                           | Myocardial infarction (presumed)   | 137              | 13              | 69               | 1               |
|                           | Other causes of cardiac failure    | 9                | 3               | 6                | 1               |
|                           | Pulmonary oedema                   | 9                | 3               | -                | 1               |
|                           | <b>Sub Total</b>                   | <b>501 (34%)</b> | <b>45 (27%)</b> | <b>146 (41%)</b> | <b>8 (31%)</b>  |
| <b>Infection</b>          | CNS - bacterial                    | -                | -               | 2                | -               |
|                           | CNS - viral                        | -                | -               | 1 (j)            | -               |
|                           | CNS - fungal                       | -                | 2 (a) (c)       | -                | -               |
|                           | Lung - bacterial                   | 37               | 4               | 11               | 1               |
|                           | Lung - fungal                      | 1 (a)            | 1 (f)           | -                | 1 (k)           |
|                           | Lung - protozoa                    | -                | 1 (g)           | -                | -               |
|                           | Lung - other                       | 5 (b)            | 1 (b)           | 3 (b)            | 1 (b)           |
|                           | Urinary tract - bacterial          | -                | 2               | -                | -               |
|                           | Urinary tract - other              | -                | -               | 1 (b)            | -               |
|                           | Wound - bacterial                  | 21               | 2               | 10               | -               |
|                           | Wound - fungal                     | 2 (c)            | -               | -                | -               |
|                           | Wound - other                      | 2 (b)            | -               | 3 (b)            | -               |
|                           | Shunt - bacterial                  | 1                | -               | -                | -               |
|                           | Peritoneum - bacterial             | 23               | -               | 11               | 1               |
|                           | Peritoneum - fungal                | 7 (a) (c)        | -               | 3 (c)            | -               |
|                           | Peritoneum - other                 | 1 (b)            | -               | -                | -               |
|                           | Septicaemia - bacterial            | 44               | 9               | 8                | -               |
|                           | Septicaemia - fungal               | 2 (c)            | 1 (h)           | -                | -               |
|                           | Septicaemia - other                | 3 (b)            | 5 (b)           | 1 (b)            | -               |
|                           | Liver - bacterial                  | 1                | -               | 1                | -               |
|                           | Liver - viral                      | 1 (d)            | 1 (c)           | -                | -               |
|                           | Other site - bacterial             | 14               | -               | 7                | 1               |
|                           | Other site - viral                 | -                | -               | -                | -               |
| Other site - other        | 1 (b)                              | -                | 2 (b)           | -                |                 |
|                           | <b>Sub Total</b>                   | <b>166 (11%)</b> | <b>29 (17%)</b> | <b>64 (18%)</b>  | <b>5 (19%)</b>  |
| <b>Vascular</b>           | Bowel infarction                   | 33               | 2               | 5                | -               |
|                           | Cerebrovascular accident           | 50               | 6               | 12               | -               |
|                           | Gastrointestinal haemorrhage       | 13               | 1               | 5                | -               |
|                           | Haemorrhage - dialysis access site | 6                | -               | 1                | -               |
|                           | Haemorrhage - elsewhere            | 8                | -               | -                | -               |
|                           | Pulmonary embolus                  | 4                | 1               | -                | -               |
|                           | Ruptured aortic aneurysm           | 6                | 1               | 3                | -               |
|                           | <b>Sub Total</b>                   | <b>120 (8%)</b>  | <b>11 (7%)</b>  | <b>26 (7%)</b>   | <b>-</b>        |
| <b>Social</b>             | Accident                           | 4                | 2               | 1                | -               |
|                           | Suicide                            | -                | 2               | -                | -               |
|                           | Therapy ceased                     | 11               | -               | 2                | -               |
|                           | Withdrawal - access problems       | 21               | -               | 3                | -               |
|                           | Withdrawal - cardiovascular        | 90               | -               | 16               | -               |
|                           | Withdrawal - cerebrovascular       | 46               | 1               | 6                | -               |
|                           | Withdrawal - malignancy            | 105              | -               | 13               | -               |
|                           | Withdrawal - peripheral vascular   | 51               | 1               | 4                | -               |
| Withdrawal - psychosocial | 217                                | 4                | 26              | -                |                 |
|                           | <b>Sub Total</b>                   | <b>545 (37%)</b> | <b>10 (6%)</b>  | <b>71 (20%)</b>  | <b>-</b>        |
| <b>Miscellaneous</b>      | Bone marrow depression             | 1                | -               | -                | -               |
|                           | Cachexia                           | 8                | 1               | 5                | -               |
|                           | Chronic respiratory failure        | 16               | 2               | 2                | 1               |
|                           | Hepatic failure                    | 9                | -               | 3                | -               |
|                           | <b>Malignancy</b>                  | <b>92</b>        | <b>51</b>       | <b>25</b>        | <b>8</b>        |
|                           | Other                              | 8                | 4               | 6                | 1               |
|                           | Pancreatitis                       | 1                | 3               | 1                | -               |
|                           | Perforation abdominal viscus       | 8                | -               | 4                | 2               |
|                           | Sclerosing peritonitis             | 2                | -               | -                | -               |
|                           | Uraemia caused by graft failure    | -                | 5               | -                | 1               |
|                           | Unknown                            | 5                | 6               | 3                | -               |
|                           | <b>Sub Total</b>                   | <b>150 (10%)</b> | <b>72 (45%)</b> | <b>49 (14%)</b>  | <b>13 (50%)</b> |
| <b>Total (100%)</b>       |                                    | <b>1482</b>      | <b>167</b>      | <b>356</b>       | <b>26</b>       |

(a) aspergillus (b) organism not isolated (c) candida (d) hepatitis C (e) cryptococcus (f) rhizopus  
 (g) pneumocystis (h) nocardia (i) hepatitis B (j) herpes simples (k) histoplasma



**Figure 3.5** **Australia**

**Death Rates, Dialysis Patients 2008 (per 100 patient years)**  
\* Treatment at Death

| Age Groups                     | 00-14      | 15-24        | 25-44       | 45-64       | 65-84       | >=85        | All Ages    |
|--------------------------------|------------|--------------|-------------|-------------|-------------|-------------|-------------|
| <b>All Dialysis</b>            |            |              |             |             |             |             |             |
| <b>All Patients Death Rate</b> | <b>3.0</b> | <b>3.2</b>   | <b>4.8</b>  | <b>9.8</b>  | <b>21.5</b> | <b>27.3</b> | <b>15.0</b> |
| No. of Deaths                  | 1          | 4            | 59          | 362         | 967         | 89          | <b>1482</b> |
| Years of Risk                  | 33         | 123          | 1215        | 3699        | 4497        | 326         | <b>9894</b> |
| <b>Diabetic Death Rate</b>     | -          | <b>285.7</b> | <b>10.0</b> | <b>13.9</b> | <b>21.2</b> | <b>27.9</b> | <b>17.1</b> |
| No. of Deaths                  | -          | 1            | 22          | 183         | 270         | 13          | <b>489</b>  |
| Years of Risk                  | -          | 0            | 220         | 1319        | 1272        | 47          | <b>2859</b> |
| <b>Non Diabetic Death Rate</b> | <b>3.0</b> | <b>2.4</b>   | <b>3.7</b>  | <b>7.5</b>  | <b>21.6</b> | <b>27.2</b> | <b>14.1</b> |
| No. of Deaths                  | 1          | 3            | 37          | 179         | 697         | 76          | <b>993</b>  |
| Years of Risk                  | 33         | 123          | 995         | 2380        | 3225        | 279         | <b>7035</b> |
| <b>Peritoneal Dialysis *</b>   |            |              |             |             |             |             |             |
| <b>All Patients Death Rate</b> | <b>3.6</b> | <b>2.4</b>   | <b>5.1</b>  | <b>8.8</b>  | <b>20.2</b> | <b>16.4</b> | <b>13.5</b> |
| No. of Deaths                  | 1          | 1            | 13          | 72          | 198         | 8           | <b>293</b>  |
| Years of Risk                  | 27         | 41           | 256         | 814         | 979         | 49          | <b>2166</b> |
| <b>Diabetic Death Rate</b>     | -          | -            | <b>16.7</b> | <b>16.0</b> | <b>21.8</b> | <b>21.5</b> | <b>18.8</b> |
| No. of Deaths                  | -          | -            | 7           | 47          | 63          | 2           | <b>119</b>  |
| Years of Risk                  | -          | -            | 42          | 294         | 289         | 9           | <b>634</b>  |
| <b>Non Diabetic Death Rate</b> | <b>3.6</b> | <b>2.4</b>   | <b>2.8</b>  | <b>4.8</b>  | <b>19.6</b> | <b>15.1</b> | <b>11.4</b> |
| No. of Deaths                  | 1          | 1            | 6           | 25          | 135         | 6           | <b>174</b>  |
| Years of Risk                  | 27         | 41           | 214         | 520         | 691         | 40          | <b>1532</b> |
| <b>Haemodialysis *</b>         |            |              |             |             |             |             |             |
| <b>All Patients Death Rate</b> | <b>0</b>   | <b>3.6</b>   | <b>4.8</b>  | <b>10.0</b> | <b>21.9</b> | <b>29.3</b> | <b>15.4</b> |
| No. of Deaths                  | 0          | 3            | 46          | 290         | 769         | 81          | <b>1189</b> |
| Years of Risk                  | 6          | 82           | 960         | 2886        | 3518        | 277         | <b>7728</b> |
| <b>Diabetic Death Rate</b>     | -          | <b>285.7</b> | <b>8.4</b>  | <b>13.3</b> | <b>21.0</b> | <b>29.5</b> | <b>16.6</b> |
| No. of Deaths                  | -          | 1            | 15          | 136         | 207         | 11          | <b>370</b>  |
| Years of Risk                  | -          | 0            | 178         | 1026        | 984         | 37          | <b>2225</b> |
| <b>Non Diabetic Death Rate</b> | <b>0</b>   | <b>2.4</b>   | <b>4.0</b>  | <b>8.3</b>  | <b>22.2</b> | <b>29.2</b> | <b>14.9</b> |
| No. of Deaths                  | 0          | 2            | 31          | 154         | 562         | 70          | <b>819</b>  |
| Years of Risk                  | 6          | 82           | 781         | 1860        | 2534        | 293         | <b>5502</b> |

**Figure 3.6** **Australia**

**Death Rates, Transplant Patients 2008 (per 100 patient years)**

| Age Groups                        | 00-04    | 05-14      | 15-24    | 25-34      | 35-44      | 45-54      | 55-64      | 65-74      | 75-84       | All Ages    |
|-----------------------------------|----------|------------|----------|------------|------------|------------|------------|------------|-------------|-------------|
| <b>All Transplants</b>            |          |            |          |            |            |            |            |            |             |             |
| <b>All Patients Death Rate</b>    | <b>0</b> | <b>0.8</b> | <b>0</b> | <b>0.6</b> | <b>1.0</b> | <b>1.0</b> | <b>2.8</b> | <b>5.2</b> | <b>17.7</b> | <b>2.3</b>  |
| No. of Deaths                     | 0        | 1          | 0        | 4          | 15         | 19         | 49         | 51         | 28          | <b>167</b>  |
| Years of Risk                     | 14       | 122        | 271      | 708        | 1458       | 1810       | 1723       | 974        | 159         | <b>7289</b> |
| <b>Diabetic Death Rate</b>        | -        | -          | -        | <b>1.9</b> | <b>1.8</b> | <b>2.6</b> | <b>4.3</b> | <b>8.7</b> | <b>0</b>    | <b>3.2</b>  |
| No. of Deaths                     | -        | -          | -        | 1          | 3          | 5          | 7          | 4          | 0           | <b>20</b>   |
| Years of Risk                     | -        | -          | -        | 52         | 165        | 196        | 164        | 46         | 1           | <b>623</b>  |
| <b>Non Diabetic Death Rate</b>    | <b>0</b> | <b>0.8</b> | <b>0</b> | <b>0.5</b> | <b>0.9</b> | <b>0.9</b> | <b>2.6</b> | <b>5.1</b> | <b>17.8</b> | <b>2.2</b>  |
| No. of Deaths                     | 0        | 1          | 0        | 3          | 12         | 14         | 42         | 47         | 28          | <b>147</b>  |
| Years of Risk                     | 14       | 122        | 271      | 657        | 1293       | 1615       | 1608       | 928        | 158         | <b>6665</b> |
| <b>Deceased Donor Transplants</b> |          |            |          |            |            |            |            |            |             |             |
| <b>All Patients Death Rate</b>    | <b>0</b> | <b>2.7</b> | <b>0</b> | <b>1.0</b> | <b>1.3</b> | <b>1.2</b> | <b>2.6</b> | <b>5.4</b> | <b>18.7</b> | <b>2.8</b>  |
| No. of Deaths                     | 0        | 1          | 0        | 3          | 12         | 14         | 34         | 41         | 25          | <b>130</b>  |
| Years of Risk                     | 1        | 36         | 93       | 291        | 899        | 1178       | 1314       | 764        | 134         | <b>4710</b> |
| <b>Diabetic Death Rate</b>        | -        | -          | -        | <b>2.2</b> | <b>2.1</b> | <b>2.6</b> | <b>3.1</b> | <b>9.4</b> | <b>0</b>    | <b>3.0</b>  |
| No. of Deaths                     | -        | -          | -        | 1          | 3          | 4          | 4          | 3          | 0           | <b>15</b>   |
| Years of Risk                     | -        | -          | -        | 45         | 143        | 151        | 128        | 32         | 1           | <b>500</b>  |
| <b>Non Diabetic Death Rate</b>    | <b>0</b> | <b>2.7</b> | <b>0</b> | <b>0.8</b> | <b>1.2</b> | <b>1.0</b> | <b>2.5</b> | <b>5.2</b> | <b>18.9</b> | <b>2.7</b>  |
| No. of Deaths                     | 0        | 1          | 0        | 2          | 9          | 10         | 30         | 38         | 25          | <b>115</b>  |
| Years of Risk                     | 1        | 36         | 93       | 246        | 756        | 1027       | 1187       | 732        | 133         | <b>4209</b> |
| <b>Live Donor Transplants</b>     |          |            |          |            |            |            |            |            |             |             |
| <b>All Patients Death Rate</b>    | <b>0</b> | <b>0</b>   | <b>0</b> | <b>0.2</b> | <b>0.5</b> | <b>0.8</b> | <b>3.3</b> | <b>4.7</b> | <b>12.0</b> | <b>1.4</b>  |
| No. of Deaths                     | 0        | 0          | 0        | 1          | 3          | 5          | 15         | 10         | 3           | <b>37</b>   |
| Years of Risk                     | 13       | 85         | 178      | 418        | 559        | 633        | 458        | 211        | 25          | <b>2579</b> |
| <b>Diabetic Death Rate</b>        | -        | -          | -        | <b>0</b>   | <b>0</b>   | <b>2.2</b> | <b>8.3</b> | <b>7.3</b> | -           | <b>4.1</b>  |
| No. of Deaths                     | -        | -          | -        | 0          | 0          | 1          | 3          | 1          | -           | <b>5</b>    |
| Years of Risk                     | -        | -          | -        | 7          | 21         | 45         | 36         | 14         | -           | <b>123</b>  |
| <b>Non Diabetic Death Rate</b>    | <b>0</b> | <b>0</b>   | <b>0</b> | <b>0.2</b> | <b>0.6</b> | <b>0.7</b> | <b>2.8</b> | <b>4.6</b> | <b>12.0</b> | <b>1.3</b>  |
| No. of Deaths                     | 0        | 0          | 0        | 1          | 3          | 4          | 12         | 9          | 3           | <b>32</b>   |
| Years of Risk                     | 13       | 85         | 178      | 411        | 538        | 588        | 422        | 197        | 25          | <b>2456</b> |

| <b>Figure 3.7</b>  |              | <b>New Zealand</b> |              |              |              |                |                 |  |
|--|--------------|--------------------|--------------|--------------|--------------|----------------|-----------------|--|
| <b>Death Rates, Dialysis Patients 2008 (per 100 patient years)</b> |              |                    |              |              |              |                |                 |  |
| <b>* Treatment at Death</b>  |              |                    |              |              |              |                |                 |  |
| <b>Age Groups</b>  | <b>00-14</b> | <b>15-24</b>       | <b>25-44</b> | <b>45-64</b> | <b>65-84</b> | <b>&gt;=85</b> | <b>All Ages</b> |  |
| <b>All Dialysis</b>  |              |                    |              |              |              |                |                 |  |
| <b>All Patients Death Rate</b>                                     | <b>12.8</b>  | <b>1.6</b>         | <b>7.5</b>   | <b>12.8</b>  | <b>27.6</b>  | <b>30.9</b>    | <b>16.9</b>     |  |
| No. of Deaths  | 2            | 1                  | 24           | 124          | 196          | 9              | <b>356</b>      |  |
| Years of Risk  | 16           | 60                 | 320          | 966          | 710          | 29             | <b>2102</b>     |  |
| <b>Diabetic Death Rate</b>   | <b>-</b>     | <b>0</b>           | <b>14.3</b>  | <b>16.1</b>  | <b>31.9</b>  | <b>37.0</b>    | <b>21.1</b>     |  |
| No. of Deaths  | -            | 0                  | 9            | 81           | 88           | 1              | <b>179</b>      |  |
| Years of Risk  | -            | 1                  | 63           | 504          | 276          | 3              | <b>847</b>      |  |
| <b>Non Diabetic Death Rate</b>                                     | <b>12.8</b>  | <b>1.7</b>         | <b>5.8</b>   | <b>9.3</b>   | <b>24.9</b>  | <b>30.3</b>    | <b>14.1</b>     |  |
| No. of Deaths  | 2            | 1                  | 15           | 43           | 108          | 8              | <b>177</b>      |  |
| Years of Risk  | 16           | 60                 | 257          | 462          | 434          | 26             | <b>1256</b>     |  |
| <b>Peritoneal Dialysis *</b>                                       |              |                    |              |              |              |                |                 |  |
| <b>All Patients Death Rate</b>                                     | <b>9.1</b>   | <b>0</b>           | <b>4.2</b>   | <b>9.9</b>   | <b>28.8</b>  | <b>24.4</b>    | <b>16.2</b>     |  |
| No. of Deaths  | 1            | 0                  | 4            | 33           | 81           | 4              | <b>123</b>      |  |
| Years of Risk  | 11           | 25                 | 95           | 333          | 281          | 16             | <b>762</b>      |  |
| <b>Diabetic Death Rate</b>   | <b>-</b>     | <b>0</b>           | <b>8.2</b>   | <b>13.7</b>  | <b>35.3</b>  | <b>58.8</b>    | <b>20.3</b>     |  |
| No. of Deaths  | -            | 0                  | 2            | 24           | 33           | 1              | <b>60</b>       |  |
| Years of Risk  | -            | 0                  | 25           | 176          | 93           | 2              | <b>296</b>      |  |
| <b>Non Diabetic Death Rate</b>                                     | <b>9.1</b>   | <b>0</b>           | <b>2.8</b>   | <b>5.7</b>   | <b>25.6</b>  | <b>20.4</b>    | <b>13.5</b>     |  |
| No. of Deaths  | 1            | 0                  | 2            | 9            | 48           | 3              | <b>63</b>       |  |
| Years of Risk  | 11           | 24                 | 71           | 158          | 187          | 15             | <b>466</b>      |  |
| <b>Haemodialysis *</b>   |              |                    |              |              |              |                |                 |  |
| <b>All Patients Death Rate</b>                                     | <b>21.6</b>  | <b>2.8</b>         | <b>8.9</b>   | <b>14.4</b>  | <b>26.8</b>  | <b>39.3</b>    | <b>17.4</b>     |  |
| No. of Deaths  | 1            | 1                  | 20           | 91           | 115          | 5              | <b>233</b>      |  |
| Years of Risk  | 5            | 36                 | 225          | 633          | 430          | 13             | <b>1341</b>     |  |
| <b>Diabetic Death Rate</b>   | <b>-</b>     | <b>-</b>           | <b>18.3</b>  | <b>17.4</b>  | <b>30.1</b>  | <b>0</b>       | <b>21.6</b>     |  |
| No. of Deaths  | -            | -                  | 7            | 57           | 55           | 0              | <b>119</b>      |  |
| Years of Risk  | -            | -                  | 38           | 329          | 183          | 1              | <b>551</b>      |  |
| <b>Non Diabetic Death Rate</b>                                     | <b>21.6</b>  | <b>2.8</b>         | <b>7.0</b>   | <b>11.2</b>  | <b>24.3</b>  | <b>42.7</b>    | <b>14.4</b>     |  |
| No. of Deaths  | 1            | 1                  | 13           | 34           | 60           | 5              | <b>114</b>      |  |
| Years of Risk  | 5            | 35                 | 186          | 305          | 247          | 12             | <b>790</b>      |  |

| <b>Figure 3.8</b>  |              | <b>New Zealand</b> |              |              |              |              |              |              |              |                 |  |
|--|--------------|--------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------|--|
| <b>Death Rates, Transplant Patients 2008 (per 100 patient years)</b> |              |                    |              |              |              |              |              |              |              |                 |  |
| <b>Age Groups</b>  | <b>00-04</b> | <b>05-14</b>       | <b>15-24</b> | <b>25-34</b> | <b>35-44</b> | <b>45-54</b> | <b>55-64</b> | <b>65-74</b> | <b>75-84</b> | <b>All Ages</b> |  |
| <b>All Transplants</b>   |              |                    |              |              |              |              |              |              |              |                 |  |
| <b>All Patients Death Rate</b>                                       | <b>0</b>     | <b>0</b>           | <b>1.6</b>   | <b>0</b>     | <b>0</b>     | <b>1.5</b>   | <b>2.7</b>   | <b>4.1</b>   | <b>18.1</b>  | <b>2.0</b>      |  |
| No. of Deaths  | 0            | 0                  | 1            | 0            | 0            | 5            | 9            | 6            | 5            | <b>26</b>       |  |
| Years of Risk  | 2            | 23                 | 61           | 122          | 265          | 333          | 329          | 145          | 28           | <b>1308</b>     |  |
| <b>Diabetic Death Rate</b>   | <b>-</b>     | <b>-</b>           | <b>-</b>     | <b>0</b>     | <b>0</b>     | <b>3.0</b>   | <b>7.2</b>   | <b>5.4</b>   | <b>-</b>     | <b>3.7</b>      |  |
| No. of Deaths  | -            | -                  | -            | 0            | 0            | 1            | 2            | 1            | -            | <b>4</b>        |  |
| Years of Risk  | -            | -                  | -            | 3            | 25           | 33           | 28           | 19           | -            | <b>108</b>      |  |
| <b>Non Diabetic Death Rate</b>                                       | <b>0</b>     | <b>0</b>           | <b>1.6</b>   | <b>0</b>     | <b>0</b>     | <b>1.3</b>   | <b>2.3</b>   | <b>4.0</b>   | <b>18.1</b>  | <b>1.8</b>      |  |
| No. of Deaths  | 0            | 0                  | 1            | 0            | 0            | 4            | 7            | 5            | 5            | <b>22</b>       |  |
| Years of Risk  | 2            | 23                 | 61           | 119          | 240          | 300          | 302          | 126          | 28           | <b>1200</b>     |  |
| <b>Deceased Donor Transplants</b>                                    |              |                    |              |              |              |              |              |              |              |                 |  |
| <b>All Patients Death Rate</b>                                       | <b>-</b>     | <b>0</b>           | <b>4.9</b>   | <b>0</b>     | <b>0</b>     | <b>1.4</b>   | <b>2.6</b>   | <b>4.4</b>   | <b>19.5</b>  | <b>2.5</b>      |  |
| No. of Deaths  | -            | 0                  | 1            | 0            | 0            | 3            | 6            | 5            | 5            | <b>20</b>       |  |
| Years of Risk  | -            | 3                  | 21           | 53           | 138          | 211          | 229          | 115          | 26           | <b>796</b>      |  |
| <b>Diabetic Death Rate</b>   | <b>-</b>     | <b>-</b>           | <b>-</b>     | <b>0</b>     | <b>0</b>     | <b>0</b>     | <b>5.6</b>   | <b>6.8</b>   | <b>-</b>     | <b>2.5</b>      |  |
| No. of Deaths  | -            | -                  | -            | 0            | 0            | 0            | 1            | 1            | -            | <b>2</b>        |  |
| Years of Risk  | -            | -                  | -            | 3            | 21           | 23           | 18           | 15           | -            | <b>80</b>       |  |
| <b>Non Diabetic Death Rate</b>                                       | <b>-</b>     | <b>0</b>           | <b>4.9</b>   | <b>0</b>     | <b>0</b>     | <b>1.6</b>   | <b>2.4</b>   | <b>4.0</b>   | <b>19.5</b>  | <b>2.5</b>      |  |
| No. of Deaths  | -            | 0                  | 1            | 0            | 0            | 3            | 5            | 4            | 5            | <b>18</b>       |  |
| Years of Risk  | -            | 5                  | 21           | 50           | 117          | 187          | 211          | 100          | 26           | <b>716</b>      |  |
| <b>Live Donor Transplants</b>  |              |                    |              |              |              |              |              |              |              |                 |  |
| <b>All Patients Death Rate</b>                                       | <b>0</b>     | <b>0</b>           | <b>0</b>     | <b>0</b>     | <b>0</b>     | <b>1.6</b>   | <b>3.0</b>   | <b>3.3</b>   | <b>0</b>     | <b>1.2</b>      |  |
| No. of Deaths  | 0            | 0                  | 0            | 0            | 0            | 2            | 3            | 1            | 0            | <b>6</b>        |  |
| Years of Risk  | 2            | 20                 | 41           | 68           | 126          | 122          | 100          | 30           | 2            | <b>512</b>      |  |
| <b>Diabetic Death Rate</b>   | <b>-</b>     | <b>-</b>           | <b>-</b>     | <b>-</b>     | <b>0</b>     | <b>10.4</b>  | <b>6.2</b>   | <b>0</b>     | <b>-</b>     | <b>7.3</b>      |  |
| No. of Deaths  | -            | -                  | -            | -            | 0            | 1            | 1            | 0            | -            | <b>2</b>        |  |
| Years of Risk  | -            | -                  | -            | -            | 4            | 10           | 10           | 4            | -            | <b>27</b>       |  |
| <b>Non Diabetic Death Rate</b>                                       | <b>0</b>     | <b>0</b>           | <b>0</b>     | <b>0</b>     | <b>0</b>     | <b>0.9</b>   | <b>2.2</b>   | <b>3.8</b>   | <b>0</b>     | <b>0.8</b>      |  |
| No. of Deaths  | 0            | 0                  | 0            | 0            | 0            | 1            | 2            | 1            | 0            | <b>4</b>        |  |
| Years of Risk  | 2            | 20                 | 41           | 68           | 122          | 113          | 90           | 26           | 2            | <b>485</b>      |  |

## DEATHS FROM MALIGNANCY

**Figure 3.9**

### Deaths from Malignancy 2008 By RRT Modality at Time of Death

| Australia                           | Dialysis  | Transplant | Total      |
|-------------------------------------|-----------|------------|------------|
| <b>Adenocarcinoma</b>               |           |            |            |
| Bladder                             | -         | 1          | 1          |
| Breast                              | 1         | -          | 1          |
| Cholangiole-Gall Bladder            | 2         | -          | 2          |
| Colon                               | 2         | 4          | 6          |
| Duodenum                            | -         | 1          | 1          |
| Kidney                              | 5 (*1)    | 2          | 7          |
| Lung                                | 5         | 1          | 6          |
| Oesophagus                          | -         | 1          | 1          |
| Ovary                               | 1         | -          | 1          |
| Pancreas                            | 3         | -          | 3          |
| Prostate                            | 6         | -          | 6          |
| Pyloric Antrum                      | -         | 1          | 1          |
| Rectum                              | 1         | 1          | 2          |
| <b>Leukaemia</b>                    | 1         | -          | 1          |
| <b>Lymphoma</b>                     |           |            |            |
| Bone Marrow                         | 2         | 1          | 3          |
| Brain                               | -         | 1          | 1          |
| Mediastinal                         | -         | 1          | 1          |
| Multiple Nodes                      | 1         | 1          | 2          |
| Primary Unknown                     | -         | 1          | 1          |
| <b>Lymphoproliferative</b>          |           |            |            |
| Bone Marrow                         | -         | 1          | 1          |
| Cervical Nodes                      | -         | 1          | 1          |
| <b>Melanoma - Skin</b>              | 3 (*1)    | 4          | 7          |
| <b>Merkel Cell</b>                  | 1         | 3          | 4          |
| <b>Myeloma</b>                      | 24 (*1)   | -          | 24         |
| <b>Squamous Cell Carcinoma</b>      |           |            |            |
| Eye                                 | -         | 1          | 1          |
| Lung                                | 3         | 1          | 4          |
| Mouth                               | 1         | 1          | 2          |
| Oesophagus                          | 1         | 2          | 3          |
| Retromolar                          | 1 (*1)    | -          | 1          |
| Skin                                | 2         | 12         | 14         |
| Tongue                              | 1         | -          | 1          |
| <b>Transitional Cell Carcinoma</b>  |           |            |            |
| Bladder                             | 2 (*1)    | -          | 2          |
| Kidney                              | 2 (*1)    | -          | 2          |
| Urinary Tract                       | 1         | -          | 1          |
| <b>Other</b>                        |           |            |            |
| Carcinoid - colon                   | 1         | -          | 1          |
| Cholangiocarcinoma - Biliary tract  | -         | 2          | 2          |
| Germ cell - testis                  | 1 (*1)    | -          | 1          |
| Haemangioblastoma - brain           | 1         | -          | 1          |
| Hepatoma - liver                    | 4         | -          | 4          |
| Large cell - peritoneum             | 1         | -          | 1          |
| Mesothelioma - peritoneum           | -         | 1          | 1          |
| Mesothelioma - pleura               | -         | 4          | 4          |
| Neuroendocrine-carcinoid - pancreas | 1         | -          | 1          |
| Non small cell - lung               | 1         | 1          | 2          |
| Plasmacytoma - ureter               | 1         | -          | 1          |
| Pseudomyxoma - peritoneum           | 1         | -          | 1          |
| Poorly differentiated - lung        | 1         | -          | 1          |
| Unknown - lung                      | 1         | -          | 1          |
| Unknown - pancreas                  | 2         | -          | 2          |
| Unknown - primary unknown           | 3         | -          | 3          |
| Unknown - prostate                  | 1         | -          | 1          |
| <b>Total Deaths</b>                 | <b>92</b> | <b>51</b>  | <b>143</b> |

\* (Seven patients) had previously been transplanted

### AUSTRALIA

During 2008 there were 143 deaths directly due to malignancies (92 among dialysis dependent and 51 among functioning transplant patients). Deaths were attributed by modality at time of death.

#### DIALYSIS DEPENDENT

Forty three patients had cancer diagnosed before or within one month of starting their first dialysis. A further nine tumours were identified between two and eight months after the first dialysis.

There were fourteen patients (never transplanted) who had dialysed for more than five years. Seven patients had a previous renal transplant.

The myeloma patients had a median survival of 28.5 months from diagnosis (range 2 -146 months).

#### FUNCTIONING TRANSPLANT

There were 51 deaths in 2008 in this group, compared to 44 deaths in 2007.

Thirty two died from non-skin cancer: twelve from adenocarcinoma, five from squamous cell carcinoma (two oesophagus, one each eye, lung and mouth), five from lymphoma, two from lymphoproliferative disease and eight from other types of malignancies shown in Figure 3.13.

Nineteen died from skin cancer: twelve from squamous cell carcinoma, four from melanoma and three from Merkel Cell.



## DEATHS FROM MALIGNANCY

### NEW ZEALAND

#### DIALYSIS DEPENDENT

There were 25 deaths due to malignancy, twelve patients were diagnosed before or within one month of starting dialysis.

One patient who was never transplanted had dialysed for five or more years. Three patients had a previous renal transplant.

Ten were diagnosed with adenocarcinoma, eight myeloma, one transitional cell carcinoma (ureter), one melanoma, one each cholangiocarcinoma (bile duct), non small cell (lung), small cell (lung), small cell (primary unknown) and unknown (lung).

#### FUNCTIONING TRANSPLANT

There were eight deaths: three from squamous cell carcinoma (all skin), two lymphomas, one each melanoma, adenocarcinoma (kidney) and unknown primary in an unknown site.

**Figure 3.10**

### Deaths from Malignancy 2008 By RRT Modality at Time of Death

| New Zealand                                     | Dialysis  | Transplant | Total     |
|---|-----------|------------|-----------|
| <b>Adenocarcinoma</b>                           |           |            |           |
| Breast  | 1         | -          | <b>1</b>  |
| Gastro-oesophageal                              | 1 (*)     | -          | <b>1</b>  |
| Kidney  | 3 (*!)    | 1          | <b>4</b>  |
| Lung  | 2         | -          | <b>2</b>  |
| Primary unknown                                 | 1         | -          | <b>1</b>  |
| Prostate  | 1         | -          | <b>1</b>  |
| Stomach   | 1         | -          | <b>1</b>  |
| <b>Lymphoma</b>                                 |           |            |           |
| Neck  | -         | 1          | <b>1</b>  |
| Retroperitoneal                                 | -         | 1          | <b>1</b>  |
| <b>Melanoma</b>                                 | 1 (*)     | 1          | <b>2</b>  |
| <b>Myeloma</b>                                  | 8         | -          | <b>8</b>  |
| <b>Squamous Cell Carcinoma</b>                  |           |            |           |
| Skin  | -         | 3          | <b>3</b>  |
| <b>TCC</b>                                      |           |            |           |
| Ureter  | 1         | -          | <b>1</b>  |
| <b>Other</b>                                    |           |            |           |
| Cholangiocarcinoma - bile duct                  | 1         | -          | <b>1</b>  |
| Non small cell - lung                           | 1         | -          | <b>1</b>  |
| Small cell - lung                               | 1         | -          | <b>1</b>  |
| Small cell - primary unknown                    | 1         | -          | <b>1</b>  |
| Unknown - lung                                  | 1         | -          | <b>1</b>  |
| Unknown - primary unknown                       | -         | 1          | <b>1</b>  |
| <b>Total Deaths</b>                             | <b>25</b> | <b>8</b>   | <b>33</b> |
| * (Three patients) were previously transplanted |           |            |           |

## DEATHS FROM WITHDRAWAL FROM TREATMENT RELATED TO MALIGNANCY

**Figure 3.11**

### Deaths from Withdrawal from Treatment Due to Malignancy 2008 By RRT Modality at Time of Death

| Dialysis Dependent                 | Australia  | New Zealand |
|------------------------------------|------------|-------------|
| <b>Adenocarcinoma</b>              |            |             |
| Anus                               | 1          | -           |
| Breast                             | 2          | -           |
| Colon                              | 6          | 3           |
| Gastric                            | 1          | -           |
| Kidney                             | 1          | 2           |
| Lung                               | 8          | -           |
| Oesophagus                         | 2          | -           |
| Pancreas                           | 2          | -           |
| Prostate                           | 6          | -           |
| Rectum / Rectosigmoid              | 4          | -           |
| <b>Leukaemia</b>                   | 4          | -           |
| <b>Lymphoma</b>                    |            |             |
| Abdomen                            | 1          | -           |
| Axillary                           | 1          | -           |
| Liver                              | 1          | -           |
| Neck                               | 1          | -           |
| Ureters                            | 1          | -           |
| Sternum                            | 1          | -           |
| <b>Melanoma</b>                    | 5          | -           |
| <b>Merkel Cell</b>                 | 1          | -           |
| <b>Myeloma</b>                     | 17         | 4           |
| <b>Squamous Cell Carcinoma</b>     |            |             |
| Breast                             | 1          | -           |
| Larynx                             | 1          | -           |
| Lung                               | 1          | -           |
| Mouth-tonsils                      | 1          | -           |
| Pharyngeal wall                    | 1          | -           |
| Skin                               | 1          | -           |
| Soft palate                        | 1          | -           |
| Vulva                              | 1          | -           |
| <b>Transitional Cell Carcinoma</b> |            |             |
| Bladder                            | 3          | -           |
| Kidney                             | 1          | -           |
| <b>Other</b>                       |            |             |
| Cholangiocarcinoma - biliary tract | 1          | -           |
| Hepatoma - liver                   | 3          | -           |
| Hodgkin's disease                  | 1          | -           |
| Large cell - lung                  | 3          | -           |
| Leiomyosarcoma - uterus            | 1          | -           |
| Mesothelioma - pleura              | 1          | -           |
| Neuroendocrine - lung              | 1          | -           |
| Non small cell - lung              | 1          | -           |
| Sarcoma - uterus                   | 1          | -           |
| Small cell - lung                  | 1          | 1           |
| Verrocous - vulva                  | 1          | -           |
| Wilms - Kidney                     | 1          | -           |
| Unknown - liver                    | 1          | -           |
| Unknown - lung                     | -          | 1           |
| Unknown - pancreas                 | 1          | -           |
| Unknown - prostate                 | 2          | -           |
| Unknown - primary unknown          | 7          | 1           |
| Unknown - stomach                  | -          | 1           |
| <b>Total Deaths</b>                | <b>105</b> | <b>13</b>   |

### AUSTRALIA

During 2008 there were 105 deaths among dialysis patients attributed to withdrawal from treatment related to malignancy.

#### DIALYSIS DEPENDENT

Forty eight of the 105 patients had cancer diagnosed before their first dialysis or within two months of commencing treatment. Eleven further tumours were identified less than twelve months after the first dialysis.

There were 23 patients who had dialysed for more than five years. Three patients dialysed for less than two months and 19 patients dialysed between two and six months before treatment was withdrawn.

Only two patients withdrawing from dialysis treatment had a previous transplant.

There were 33 cases with adenocarcinoma, 17 with myeloma, eight with squamous cell carcinoma, six with lymphoma, five with melanoma, four with leukaemia, four with transitional cell carcinoma, one with Merkel Cell, and 27 other types of malignancies.

The myeloma patients had a median survival from diagnosis of 46.0 months (range 2-101 months).

#### FUNCTIONING TRANSPLANT

There were no patients in this group in 2008.

### NEW ZEALAND

#### DIALYSIS DEPENDENT

Thirteen patients had withdrawal from treatment related to malignancy in 2008.

Six of the thirteen patients had cancer diagnosed before their first dialysis or within a month of starting treatment.

There were five adenocarcinoma, four myeloma and four other types of malignancies.

One patient had dialysed for more than five years, one patient for less than two months and three patients between two and six months before treatment was withdrawn. None had a previous renal transplant.

#### FUNCTIONING TRANSPLANT

There were no patients in this group in 2008.