

CHAPTER 14

Renal Transplantation

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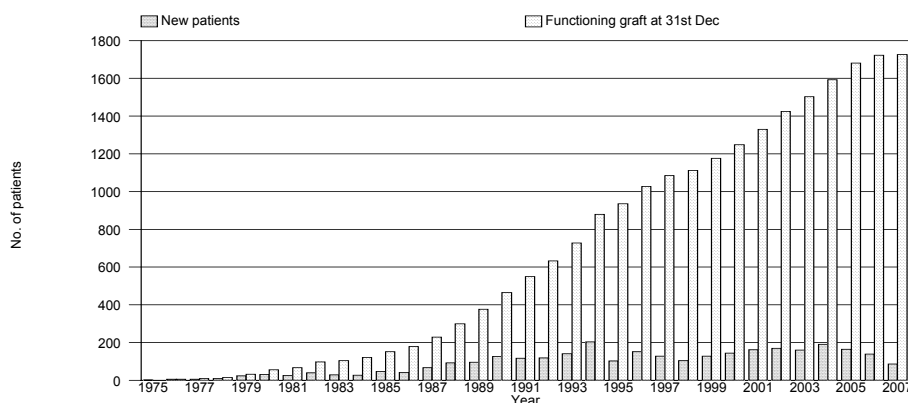
SECTION 14.1: STOCK AND FLOW

The number of new renal transplant patients shows an initial rise from 104 transplants per year in 1998 to a peak of 190 transplants in 2004. This is a rise of >80% but the number declined subsequently to only 86 in 2007 (Table 14.1.1). This is due to reduction in the number of transplantations done in China. As renal transplantation in the country is still dependant on the availability of commercial cadaveric transplantation done abroad this drop was foreseeable. The number of functioning renal transplants reported to the National Transplant Registry (NTR) had increased from 1112 in 1998 to 1726 in 2007 (Table 14.1.1).

Table 14.1.1: Stock and Flow of Renal Transplantation, 1998-2007

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|------------------------------------|------|------|------|------|------|------|------|------|------|------|
| New transplant patients | 104 | 127 | 143 | 162 | 169 | 160 | 190 | 163 | 138 | 86 |
| Died | 26 | 25 | 30 | 37 | 32 | 37 | 41 | 43 | 50 | 34 |
| Graft failure | 49 | 36 | 32 | 40 | 38 | 41 | 44 | 21 | 36 | 36 |
| Lost to Follow up | 1 | 1 | 9 | 4 | 5 | 4 | 14 | 11 | 11 | 12 |
| Functioning graft at 31st December | 1112 | 1177 | 1249 | 1330 | 1424 | 1502 | 1593 | 1681 | 1722 | 1726 |

Figure 14.1.1: Stock and Flow of Renal Transplantation, 1975-2007



The incidence of renal transplantation stabilised at a modest rate of 5-7 per million population (Table 14.1.2) while transplant prevalence rate has grown slowly from 50 per million in 1998 to 64 per million population in 2007, an increase of 30% over the 1998 figures. However compared to growth in the prevalence rate of dialysis patients (which has increased by 300% from 205 in 1998 to 615 in 2007) our transplant prevalence rate has not kept up. (refer table 2.1.2, chapter 2)

Table 14.1.2: New transplant rate per million population (pmp), 1998-2007

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|--------------------------|------|------|------|------|------|------|------|------|------|------|
| New transplant patients | 104 | 127 | 143 | 162 | 169 | 160 | 190 | 163 | 138 | 86 |
| New transplant rate, pmp | 5 | 6 | 6 | 7 | 7 | 6 | 7 | 6 | 5 | 3 |

Figure 14.1.2: New transplant rate, 1975-2007

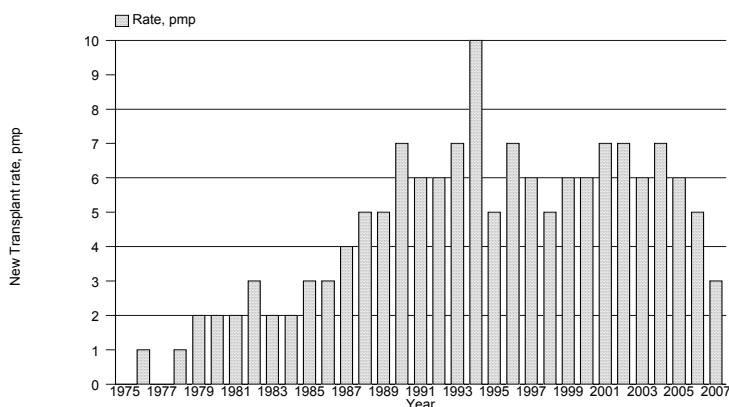
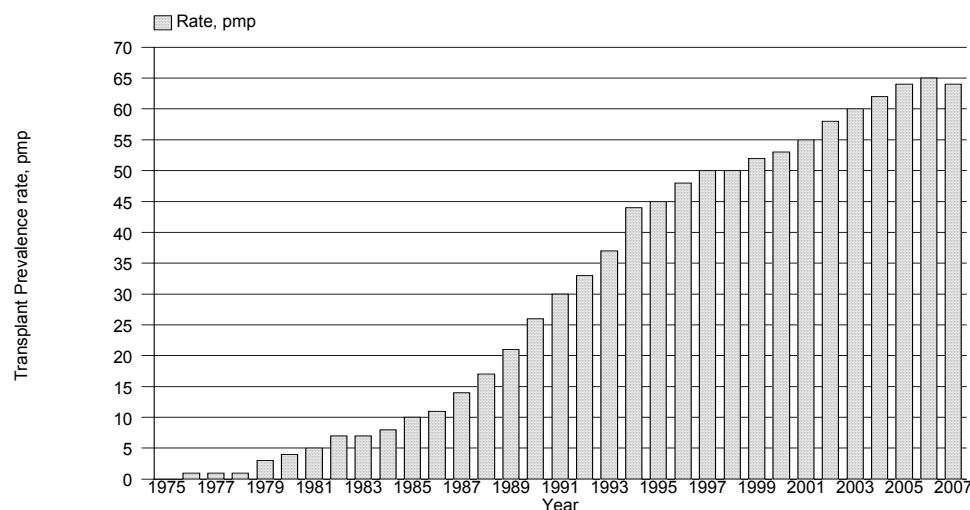


Table 14.1.3: Transplant prevalence rate per million population (pmp), 1998-2007

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---------------------------------|------|------|------|------|------|------|------|------|------|------|
| Functioning graft at 31st Dec | 1112 | 1177 | 1249 | 1330 | 1424 | 1502 | 1593 | 1681 | 1722 | 1726 |
| Transplant prevalence rate, pmp | 50 | 52 | 53 | 55 | 58 | 60 | 62 | 64 | 65 | 64 |

Figure 14.1.3: Transplant prevalence rate, 1975-2007



In terms of place of transplantation, transplantation within local centres has grown slightly from 40 cases (39% of renal transplants) in 1998 to 52 cases (60% of renal transplants) in 2007. This translates to a net increase of 1 case per year over the 10 year period. This is disturbing data as it underscores our failure to improve transplantation rates within the country which is mainly due to the lack of both living as well as cadaver donors. Transplantation in China in 2007 only comprised 34% of all of renal transplant recipients with 29 patients. In fact this is the first time local transplantation out-perform China transplantation over the last decade.

Table 14.1.4: Place of transplantation, 1998-2007

| Year | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | |
|-------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| HKL | 33 | 32 | 36 | 28 | 28 | 20 | 33 | 20 | 28 | 17 |
| UMMC | 7 | 7 | 16 | 13 | 19 | 13 | 23 | 14 | 14 | 8 |
| Selayang Hospital | 0 | 0 | 0 | 0 | 4 | 3 | 11 | 7 | 11 | 7 |
| Other local | 0 | 0 | 1 | 1 | 3 | 2 | 4 | 2 | 1 | 1 |
| China | 50 | 48 | 62 | 49 | 80 | 56 | 83 | 51 | 103 | 61 |
| India | 7 | 7 | 5 | 4 | 9 | 6 | 7 | 4 | 12 | 7 |
| Other overseas | 3 | 3 | 2 | 2 | 0 | 0 | 1 | 1 | 0 | 0 |
| Unknown | 4 | 4 | 5 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 104 | 100 | 127 | 100 | 143 | 100 | 162 | 100 | 169 | 100 |

| Year | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | | TOTAL | |
|-------------------|------|-----|------|-----|------|-----|------|-----|------|-----|-------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| HKL | 26 | 16 | 20 | 11 | 32 | 20 | 35 | 25 | 35 | 41 | 306 | 21 |
| UMMC | 6 | 4 | 7 | 4 | 7 | 4 | 5 | 4 | 0 | 0 | 104 | 7 |
| Selayang Hospital | 11 | 7 | 11 | 6 | 5 | 3 | 8 | 6 | 14 | 16 | 75 | 5 |
| Other local | 1 | 1 | 2 | 1 | 5 | 3 | 2 | 1 | 3 | 3 | 22 | 2 |
| China | 111 | 69 | 137 | 72 | 108 | 66 | 79 | 57 | 29 | 34 | 842 | 58 |
| India | 4 | 3 | 11 | 6 | 5 | 3 | 7 | 5 | 1 | 1 | 68 | 5 |
| Other overseas | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 4 | 5 | 16 | 1 |
| Unknown | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1 |
| TOTAL | 160 | 100 | 190 | 100 | 163 | 100 | 138 | 100 | 86 | 100 | 1442 | 100 |

SECTION 14.2: RECIPIENTS' CHARACTERISTICS

In terms of renal transplant recipients' characteristics, age at transplant has been stable at 35 to 42 years and between 57% and 67% of recipients are males over the last 10 years. There has been an increase in the population of diabetic patients undergoing transplantation from 10% in 1998 to 20% in 2006 (Table 14.2.1). However, there is a drastic drop in number of diabetic patients who underwent transplantation in 2007 (12%). This coincided with the drop in China transplants where the majority of the diabetic patients underwent their transplantation. Patients with hepatitis B and hepatitis C remained static at around 7%. In terms of cause of end stage renal failure (Table 14.2.2), the primary cause was still glomerulonephritis, followed by hypertension and diabetes as the third cause. Up to 40% of transplant recipients had end stage renal disease due to unknown causes, belying the fact that we often diagnose these patients too late.

Table 14.2.1: Renal Transplant Recipients' Characteristics, 1998-2007

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|------|------|------|------|------|------|------|------|------|------|
| New Transplant Patients | 104 | 127 | 143 | 162 | 169 | 160 | 190 | 163 | 138 | 86 |
| Age at transplant (years), Mean | 37 | 37 | 39 | 41 | 41 | 42 | 41 | 38 | 37 | 35 |
| Age at transplant (years), SD | 11 | 13 | 14 | 13 | 12 | 13 | 13 | 14 | 15 | 15 |
| % Male | 58 | 62 | 64 | 62 | 57 | 66 | 62 | 70 | 67 | 62 |
| % Diabetic (co-morbid/ primary renal disease) | 10 | 11 | 15 | 19 | 15 | 22 | 22 | 20 | 20 | 12 |
| % HBsAg positive | 6 | 4 | 5 | 5 | 7 | 8 | 5 | 4 | 7 | 5 |
| % Anti-HCV positive | 18 | 11 | 8 | 15 | 9 | 10 | 8 | 2 | 7 | 11 |

Table 14.2.2: Primary causes of end stage renal failure, 1998-2007

| Year | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | |
|--------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| New transplant patients | 104 | 100 | 127 | 100 | 143 | 100 | 162 | 100 | 169 | 100 |
| Glomerulonephritis | 28 | 27 | 41 | 32 | 49 | 34 | 43 | 27 | 53 | 31 |
| Diabetes Mellitus | 5 | 5 | 10 | 8 | 16 | 11 | 23 | 14 | 16 | 9 |
| Hypertension | 5 | 5 | 7 | 6 | 20 | 14 | 17 | 10 | 24 | 14 |
| Obstructive uropathy | 4 | 4 | 4 | 3 | 3 | 2 | 3 | 2 | 2 | 1 |
| ADPKD | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 3 | 2 |
| Drugs/ toxic nephropathy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hereditary nephritis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unknown | 54 | 52 | 62 | 49 | 54 | 38 | 61 | 38 | 68 | 40 |
| Others | 11 | 11 | 6 | 5 | 12 | 8 | 23 | 14 | 16 | 9 |

| Year | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | |
|--------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| New transplant patients | 160 | 100 | 190 | 100 | 163 | 100 | 138 | 100 | 86 | 100 |
| Glomerulonephritis | 54 | 34 | 62 | 33 | 45 | 28 | 51 | 37 | 26 | 30 |
| Diabetes Mellitus | 26 | 16 | 32 | 17 | 29 | 18 | 21 | 15 | 6 | 7 |
| Hypertension | 25 | 16 | 51 | 27 | 38 | 23 | 29 | 21 | 20 | 23 |
| Obstructive uropathy | 2 | 1 | 4 | 2 | 3 | 2 | 4 | 3 | 1 | 1 |
| ADPKD | 5 | 3 | 5 | 3 | 3 | 2 | 1 | 1 | 0 | 0 |
| Drugs/ toxic nephropathy | 2 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Hereditary nephritis | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unknown | 58 | 36 | 83 | 44 | 50 | 31 | 42 | 30 | 32 | 37 |
| Others | 12 | 8 | 27 | 14 | 17 | 10 | 16 | 12 | 12 | 14 |

SECTION 14.3: TRANSPLANT PRACTICES

In 2006, 62% of the renal transplant recipients received their grafts from commercial sources. Fifty-eight percent of these were from commercial cadavers. Live donor transplantation made up 21% of transplants (28 recipients) in the same year which was down from 29 cases (29%) in 1998 and 41 cases (25%) in 2005. Local cadaveric donation made up 18% of transplants (24 recipients) in 2006 although it had shown an initial promising rise to 37 recipients in 2001. 2007 marked the first time in 10 years there were more local transplantations (37%) compared to commercial transplantations in China (34%).

Table 14.3.1: Type of Renal Transplantation, 1998-2007

| Year | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | |
|----------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Commercial cadaver | 51 | 51 | 62 | 51 | 80 | 56 | 83 | 51 | 103 | 61 |
| Commercial live donor | 4 | 4 | 4 | 3 | 9 | 6 | 6 | 4 | 11 | 7 |
| Live donor (genetically related) | 28 | 28 | 40 | 33 | 21 | 15 | 32 | 20 | 30 | 18 |
| Live donor (emotionally related) | 2 | 2 | 5 | 4 | 6 | 4 | 4 | 2 | 3 | 2 |
| Cadaver | 15 | 15 | 10 | 8 | 27 | 19 | 37 | 23 | 22 | 13 |
| Total | 100 | 100 | 121 | 100 | 143 | 100 | 162 | 100 | 169 | 100 |

| Year | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | |
|----------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Commercial cadaver | 112 | 70 | 143 | 76 | 105 | 64 | 80 | 58 | 28 | 33 |
| Commercial live donor | 3 | 2 | 6 | 3 | 8 | 5 | 5 | 4 | 2 | 2 |
| Live donor (genetically related) | 25 | 16 | 21 | 11 | 38 | 23 | 24 | 17 | 20 | 24 |
| Live donor (emotionally related) | 5 | 3 | 2 | 1 | 3 | 2 | 4 | 3 | 11 | 13 |
| Cadaver | 15 | 9 | 17 | 9 | 9 | 6 | 25 | 18 | 24 | 28 |
| Total | 160 | 100 | 189 | 100 | 163 | 100 | 138 | 100 | 85 | 100 |

*Commercial Cadaver (China, India, other oversea) *Commercial live donor (living unrelated) *Cadaver (local)

Table 14.3.2: Biochemical data, 2005-2007

| Biochemical parameters | Summary | 2005 | 2006 | 2007 |
|------------------------|---------|-------|-------|-------|
| Creatinine, umol/L | N | 1635 | 1592 | 1685 |
| | Mean | 133.6 | 135.7 | 131.9 |
| | SD | 65.4 | 81.3 | 77.6 |
| | Median | 120 | 120 | 116 |
| | Minimum | 35 | 21.7 | 36 |
| | Maximum | 763 | 1152 | 1186 |
| Hb, g/dL | N | 1635 | 1592 | 1685 |
| | Mean | 12.8 | 12.7 | 12.8 |
| | SD | 1.9 | 1.9 | 1.9 |
| | Median | 12.9 | 12.8 | 12.8 |
| | Minimum | 5.5 | 3.3 | 4.4 |
| | Maximum | 19 | 19.8 | 18.7 |
| Albumin, g/L | N | 1635 | 1592 | 1685 |
| | Mean | 39.9 | 39.9 | 39.9 |
| | SD | 0.5 | 0.7 | 0.8 |
| | Median | 39.9 | 39.9 | 39.9 |
| | Minimum | 34 | 29 | 29 |
| | Maximum | 46 | 48 | 48 |

Table 14.3.2: Biochemical data, 2005-2007 (cont'd)

| Biochemical parameters | Summary | 2005 | 2006 | 2007 |
|--------------------------------|---------|-------|-------|-------|
| Calcium, mmol/L | N | 1635 | 1592 | 1685 |
| | Mean | 2.3 | 2.3 | 2.3 |
| | SD | 0.2 | 0.2 | 0.2 |
| | Median | 2.3 | 2.3 | 2.3 |
| | Minimum | 1.2 | 1.1 | 1.4 |
| | Maximum | 3.3 | 3.1 | 3.2 |
| Phosphate, mmol/L | N | 1635 | 1592 | 1685 |
| | Mean | 1.1 | 1.1 | 1.1 |
| | SD | 0.2 | 0.2 | 0.3 |
| | Median | 1.1 | 1.1 | 1.1 |
| | Minimum | 0.5 | 0.5 | 0.5 |
| | Maximum | 3.3 | 3.5 | 3.9 |
| Alkaline Phosphate (ALP), U/L | N | 1635 | 1592 | 1685 |
| | Mean | 79 | 79.1 | 79.1 |
| | SD | 46.5 | 43.2 | 38.4 |
| | Median | 73 | 71 | 72 |
| | Minimum | 20 | 24 | 22 |
| | Maximum | 831 | 700 | 439 |
| ALT, U/L | N | 1635 | 1592 | 1685 |
| | Mean | 30.8 | 29.9 | 29.9 |
| | SD | 30.9 | 30.4 | 25.7 |
| | Median | 24 | 22 | 23 |
| | Minimum | 4 | 4 | 4 |
| | Maximum | 613 | 433 | 356 |
| Total cholesterol, mmol/L | N | 1635 | 1592 | 1685 |
| | Mean | 5.3 | 5.3 | 5.2 |
| | SD | 1 | 1 | 1 |
| | Median | 5.3 | 5.3 | 5.3 |
| | Minimum | 1.7 | 1.5 | 1.7 |
| | Maximum | 10.1 | 11.1 | 11.4 |
| LDL cholesterol, mmol/L | N | 1635 | 1592 | 1685 |
| | Mean | 3 | 3 | 3 |
| | SD | 0.8 | 0.8 | 0.8 |
| | Median | 3 | 3 | 3 |
| | Minimum | 0.9 | 1 | 1 |
| | Maximum | 9.2 | 11.1 | 8.9 |
| HDL cholesterol, mmol/L | N | 1635 | 1592 | 1685 |
| | Mean | 1.6 | 1.6 | 1.5 |
| | SD | 0.5 | 0.5 | 0.4 |
| | Median | 1.6 | 1.6 | 1.6 |
| | Minimum | 0.4 | 0.4 | 0.4 |
| | Maximum | 5.6 | 5.8 | 7.5 |
| Systolic Blood Pressure, mmHg | N | 1635 | 1592 | 1685 |
| | Mean | 133.3 | 130.8 | 131.7 |
| | SD | 16.9 | 15.9 | 15.7 |
| | Median | 130 | 130 | 130 |
| | Minimum | 80 | 66 | 80 |
| | Maximum | 220 | 210 | 210 |
| Diastolic Blood Pressure, mmHg | N | 1635 | 1592 | 1685 |
| | Mean | 80.5 | 78.9 | 78.8 |
| | SD | 9.2 | 9.8 | 9.4 |
| | Median | 80 | 80 | 80 |
| | Minimum | 50 | 30 | 20 |
| | Maximum | 127 | 120 | 116 |

In 2007, Cyclosporine based regimes remained the mainstay of immunosuppressive therapy with 72% of patients receiving it. Tacrolimus based regimes accounted for 21%. There has been continuous increase in the use of Mycophenolate Mofetil as the second immunosuppressive agent in 54% of patients in 2007 compared to 37% of patients in 2004. During the same period, the use of Azathioprine declined from 43% in 2004 to 29% in 2007. Monotherapy of immunosuppression is mostly not noted except in a small number of patients. Sirolimus was used in 2% of all transplant recipients in 2007.

In terms of non immunosuppressive medications, only 36% of patients were on ACEI or AIIRB's or both and this trend has been relatively static since 2004. Calcium Channel blockers appeared to be the mainstay of antihypertensive therapy in 65% of patients whilst Beta Blockers use was reported in 49% of patients. Other antihypertensives were reported in 8% of patients. The widespread use of Calcium Channel blockers either as monotherapy or combination may be due to the use of the dihydropyridine group to minimise the dose of Cyclosporine, which remains the main immunosuppressive drug.

Table 14.3.3: Medication data, 2005-2007

| Medication data | Single drug treatment | | | | | | Combined drug treatment | | | | | |
|--|-----------------------|-----|------|-----|------|-----|-------------------------|-----|------|-----|------|-----|
| | 2005 | | 2006 | | 2007 | | 2005 | | 2006 | | 2007 | |
| | N | % | N | % | N | % | N | % | N | % | N | % |
| All | 1563 | 100 | 1480 | 100 | 1661 | 100 | 1563 | 100 | 1480 | 100 | 1661 | 100 |
| (i) Immunosuppressive drug(s) treatment | | | | | | | | | | | | |
| Prednisolone | 12 | 1 | 8 | 1 | 9 | 1 | 1529 | 98 | 1442 | 97 | 1607 | 97 |
| Azathioprine | 1 | 0 | 0 | 0 | 0 | 0 | 605 | 39 | 496 | 34 | 478 | 29 |
| Cyclosporin A | 4 | 0 | 5 | 0 | 8 | 0 | 1221 | 78 | 1118 | 76 | 1188 | 72 |
| Tacrolimus (FK506) | 0 | 0 | 0 | 0 | 4 | 0 | 225 | 14 | 254 | 17 | 347 | 21 |
| Mycophenolate Mofetil (MMF) | 0 | 0 | 0 | 0 | 1 | 0 | 683 | 44 | 708 | 48 | 903 | 54 |
| Rapamycin | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 1 | 6 | 0 | 33 | 2 |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1 | 18 | 1 | 4 | 0 |
| (ii) Non-Immunosuppressive drug(s) treatment | | | | | | | | | | | | |
| Beta blocker | 105 | 7 | 77 | 5 | 90 | 5 | 667 | 43 | 597 | 40 | 735 | 44 |
| Calcium channel blocker | 195 | 12 | 199 | 13 | 183 | 11 | 822 | 53 | 787 | 53 | 903 | 54 |
| ACE inhibitor | 60 | 4 | 39 | 3 | 38 | 2 | 342 | 22 | 292 | 20 | 384 | 23 |
| AIIRB | 20 | 1 | 27 | 2 | 18 | 1 | 161 | 10 | 141 | 10 | 210 | 13 |
| Anti-lipid | 67 | 4 | 155 | 10 | 94 | 6 | 602 | 39 | 678 | 46 | 730 | 44 |
| Other anti-hypertensive | 5 | 0 | 11 | 1 | 6 | 0 | 158 | 10 | 159 | 11 | 140 | 8 |

SECTION 14.4: TRANSPLANT OUTCOMES**14.4.1 Post-transplant complications**

Sixty-three percent of patients were hypertensive prior to transplantation whereas 27% developed hypertension post transplantation. Fourteen percent of patients had diabetes mellitus prior to transplant whereas only 7% of patients developed post transplant diabetes mellitus. In terms of cardiovascular and cerebrovascular disease 4% had either or both prior to transplant whereas 3% developed these post transplantation.

Table 14.4.1: Post-transplant complications, 2005-2007

| Post transplant complications | Complication developed before transplant (regardless of complication after transplantation) | | | | | | Complication developed only after transplantation | | | | | |
|---|---|-----|------|-----|------|-----|---|-----|------|-----|------|-----|
| | 2005 | | 2006 | | 2007 | | 2005 | | 2006 | | 2007 | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| All patients | 1637 | 100 | 1592 | 100 | 1685 | 100 | 1637 | 100 | 1592 | 100 | 1685 | 100 |
| Diabetes (either as Primary Renal Disease or co-morbid) | 219 | 13 | 215 | 14 | 228 | 14 | 122 | 7 | 125 | 8 | 113 | 7 |
| Cancer | 2 | 0 | 2 | 0 | 3 | 0 | 19 | 1 | 20 | 1 | 21 | 1 |
| Cardiovascular disease + cerebrovascular disorder | 78 | 5 | 73 | 5 | 72 | 4 | 45 | 3 | 45 | 3 | 54 | 3 |
| Hypertension | 1049 | 64 | 1032 | 65 | 1059 | 63 | 438 | 27 | 355 | 22 | 453 | 27 |

*Hypertension: BP systolic >140 and BP diastolic >90

OR have either Beta blocker / Calcium channel blocker / ACE inhibitor / AIIIRB / Other anti-hypertensive

14.4.2 Deaths and Graft loss

In 2007, 34 transplant recipients died and 36 lost their grafts. The rates of transplant death and graft loss have remained static for the past 10 years (Table 14.4.2). The main known causes of death have been infection and cardiovascular disease with 33% and 18% respectively. Another 10% of patients died at home, which is usually presumed to be cardiovascular death as well.

Cancer death rates have been significantly high since 2003 contributing to 15% of all deaths in 2003, 18% in 2004 and 15% in 2007. Death due to liver disease has remained relatively static at 5-9% from 2003 to 2006.

In terms of graft loss, 69% were due to rejection with 3% apiece for vascular causes and infections in 2007 and these figures have remained relatively stable for the last 4 years.

Table 14.4.2: Transplant Patients Death Rate and Graft Loss, 1998– 2007

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-------------------------|------|------|------|------|------|------|------|------|------|------|
| No. at risk | 1097 | 1144 | 1212 | 1289 | 1376 | 1462 | 1547 | 1636 | 1701 | 1723 |
| Transplant death | 26 | 25 | 30 | 37 | 32 | 37 | 41 | 43 | 50 | 34 |
| Transplant death rate % | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 2 |
| Graft loss | 49 | 36 | 32 | 40 | 38 | 41 | 44 | 21 | 36 | 36 |
| Graft loss rate % | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 2 |
| Acute rejection | 0 | 0 | 0 | 0 | 0 | 3 | 19 | 14 | 18 | 10 |
| Acute rejection rate % | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| All losses | 75 | 61 | 62 | 77 | 70 | 78 | 85 | 64 | 86 | 70 |
| All losses rate % | 7 | 5 | 5 | 6 | 5 | 5 | 5 | 4 | 5 | 4 |

*Graft loss=graft failure

*All losses=death / graft loss (acute rejection happens concurrently with graft failure / death)

Figure 14.4.2(a): Transplant Recipient Death Rate, 1976-2007

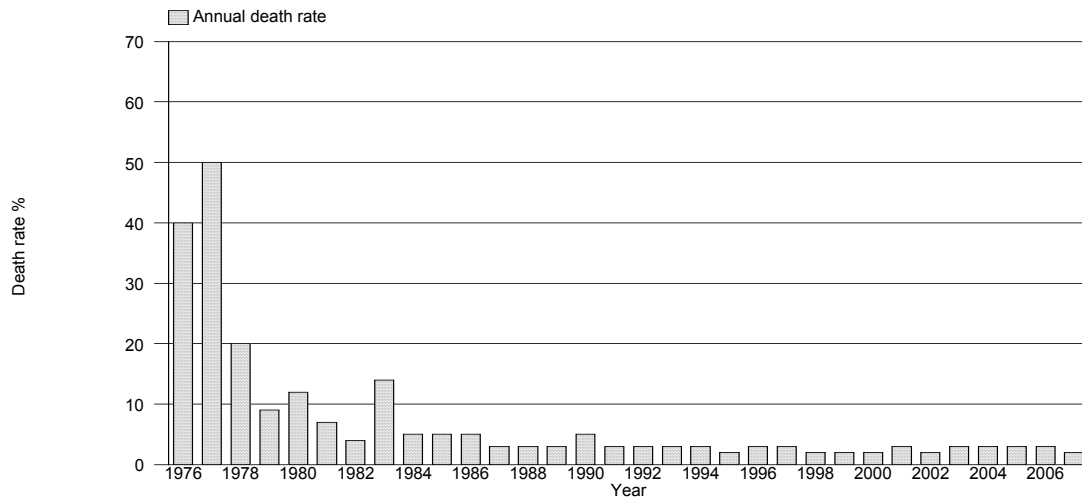


Figure 14.4.2(b): Transplant Recipient Graft Loss Rate, 1976-2007

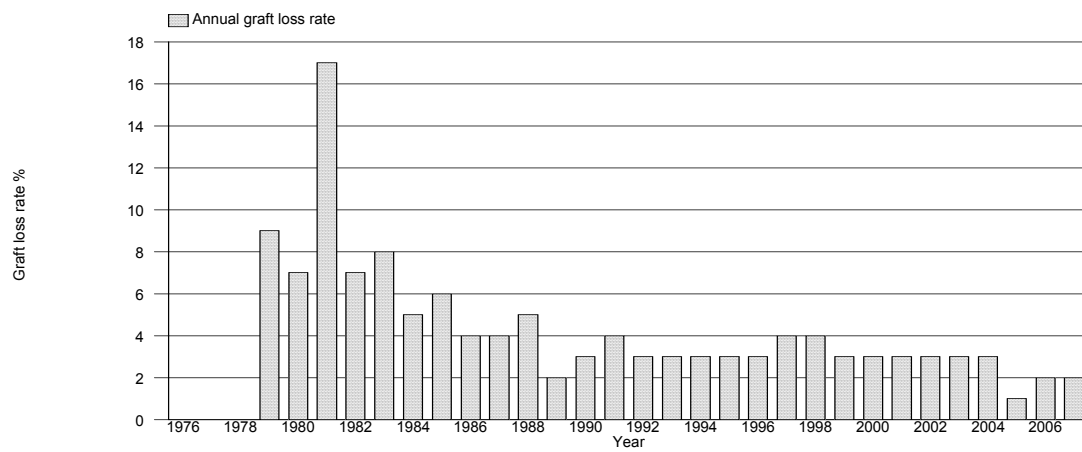


Table 14.4.3: Causes of Death in Transplant Recipients, 1998-2007

| Year | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | |
|------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Cardiovascular | 3 | 11 | 4 | 13 | 10 | 29 | 7 | 16 | 5 | 16 |
| Died at home | 4 | 15 | 6 | 19 | 1 | 3 | 5 | 12 | 5 | 16 |
| Infection | 10 | 37 | 7 | 23 | 12 | 35 | 20 | 47 | 9 | 28 |
| Graft failure | 0 | 0 | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 0 |
| Cancer | 3 | 11 | 3 | 10 | 2 | 6 | 6 | 14 | 4 | 13 |
| Liver disease | 2 | 7 | 3 | 10 | 1 | 3 | 1 | 2 | 3 | 9 |
| Accidental death | 0 | 0 | 1 | 3 | 1 | 3 | 1 | 2 | 1 | 3 |
| Others | 2 | 7 | 5 | 16 | 3 | 9 | 2 | 5 | 3 | 9 |
| Unknown | 3 | 11 | 2 | 6 | 2 | 6 | 1 | 2 | 2 | 6 |
| TOTAL | 27 | 100 | 31 | 100 | 34 | 100 | 43 | 100 | 32 | 100 |

| Year | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | |
|------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Cardiovascular | 9 | 23 | 4 | 9 | 5 | 11 | 10 | 18 | 7 | 18 |
| Died at home | 5 | 12 | 6 | 13 | 5 | 11 | 7 | 13 | 4 | 10 |
| Infection | 11 | 28 | 11 | 24 | 22 | 50 | 22 | 40 | 13 | 33 |
| Graft failure | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 0 | 3 | 8 |
| Cancer | 6 | 15 | 8 | 18 | 5 | 11 | 4 | 7 | 6 | 15 |
| Liver disease | 2 | 5 | 3 | 7 | 3 | 7 | 5 | 9 | 0 | 0 |
| Accidental death | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Others | 5 | 12 | 10 | 22 | 3 | 7 | 4 | 7 | 2 | 5 |
| Unknown | 2 | 5 | 1 | 2 | 1 | 2 | 3 | 5 | 4 | 10 |
| TOTAL | 40 | 100 | 45 | 100 | 44 | 100 | 55 | 100 | 39 | 100 |

Table 14.4.4: Causes of Graft Failure, 1998-2007

| Year | 1998 | | 1999 | | 2000 | | 2001 | | 2002 | |
|----------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Rejection | 28 | 53 | 23 | 64 | 19 | 59 | 25 | 61 | 22 | 55 |
| Calcineurin toxicity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other drug toxicity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ureteric obstruction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Infection | 1 | 2 | 0 | 0 | 1 | 3 | 2 | 5 | 0 | 0 |
| Vascular causes | 3 | 6 | 1 | 3 | 3 | 9 | 1 | 2 | 0 | 0 |
| Recurrent/ de novo renal disease | 1 | 2 | 0 | 0 | 0 | 0 | 2 | 5 | 2 | 5 |
| Others | 5 | 9 | 0 | 0 | 2 | 6 | 0 | 0 | 4 | 10 |
| Unknown | 15 | 28 | 12 | 33 | 7 | 22 | 11 | 27 | 12 | 30 |
| TOTAL | 53 | 100 | 36 | 100 | 32 | 100 | 41 | 100 | 40 | 100 |

| Year | 2003 | | 2004 | | 2005 | | 2006 | | 2007 | |
|----------------------------------|------|-----|------|-----|------|-----|------|-----|------|-----|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Rejection | 21 | 48 | 33 | 70 | 18 | 75 | 28 | 68 | 25 | 69 |
| Calcineurin toxicity | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 |
| Other drug toxicity | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ureteric obstruction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| Infection | 2 | 5 | 1 | 2 | 1 | 4 | 3 | 7 | 1 | 3 |
| Vascular causes | 3 | 7 | 4 | 9 | 2 | 8 | 3 | 7 | 1 | 3 |
| Recurrent/ de novo renal disease | 2 | 5 | 1 | 2 | 0 | 0 | 1 | 2 | 0 | 0 |
| Others | 1 | 2 | 0 | 0 | 1 | 4 | 3 | 7 | 4 | 11 |
| Unknown | 15 | 34 | 7 | 15 | 2 | 8 | 2 | 5 | 4 | 11 |
| TOTAL | 44 | 100 | 47 | 100 | 24 | 100 | 41 | 100 | 36 | 100 |

SECTION 14.5: PATIENT AND GRAFT SURVIVAL

Overall patient survival rates from 1994 to 2007 have been 95%, 91%, 88% and 81% at year 1, 3, 5 and 10 respectively. Overall graft survival rate has been 92%, 85%, 79% and 64% at year 1, 3, 5 and 10 respectively.

Table 14.5.1: Patient survival, 1994-2007

| Interval (years) | No. | % Survival | SE |
|------------------|------|------------|----|
| 1 | 1777 | 95 | 1 |
| 3 | 1380 | 91 | 1 |
| 5 | 993 | 88 | 1 |
| 10 | 349 | 81 | 1 |
| 12 | 151 | 76 | 2 |

*No.=Number at risk SE=standard error

Figure 14.5.1: Patient survival, 1994-2007

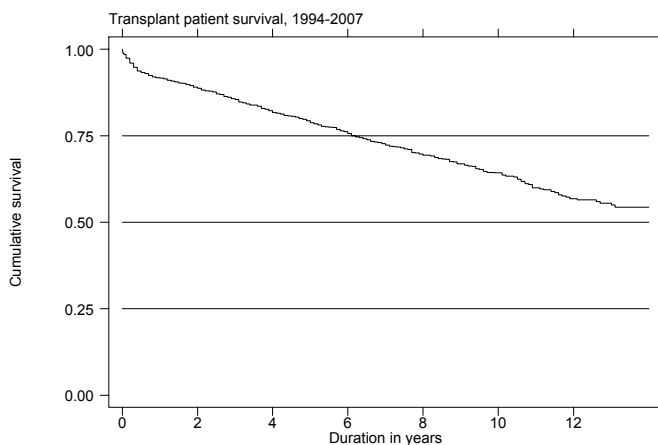
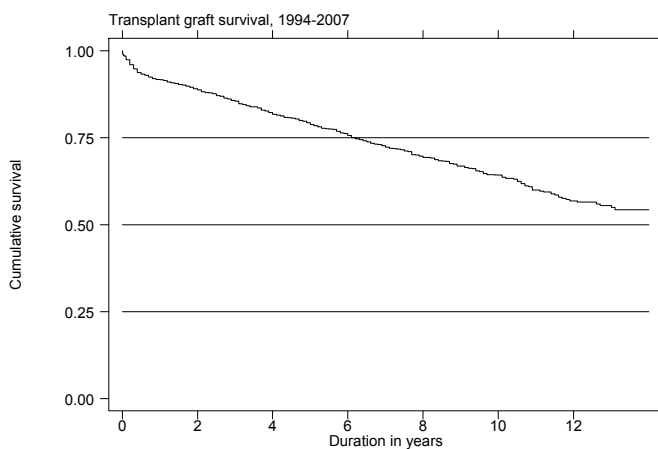


Table 14.5.2: Graft survival, 1994-2007

| Interval (years) | No. | % Survival | SE |
|------------------|------|------------|----|
| 1 | 1777 | 92 | 1 |
| 3 | 1380 | 85 | 1 |
| 5 | 993 | 79 | 1 |
| 10 | 349 | 64 | 1 |
| 12 | 151 | 57 | 2 |

*No.=Number at risk SE=standard error

Figure 14.5.2: Graft survival, 1994-2007



Outcomes of renal transplantation from the 4 donor groups are shown in respect to patient and graft survival in the Kaplan Meier survival graphs in Figures 14.5.3 and 14.5.4 respectively. In terms of patient survival, live donor grafts maintained the best survival rates with 97%, 95%, 94% and 90% at years 1, 3, 5 and 10 respectively. In terms of graft survival, commercial cadaver grafts performed similarly well with a survival of 94%, 89%, 82% and 70% at year 1, 3, 5 and 10 compared to 92%, 88%, 83% and 69% for the same intervals for live donor grafts.

Table 14.5.3: Patient survival by type of transplant, 1994-2007

| Type of Transplant Interval (years) | Commercial Cadaver | | | Commercial Live Donor | | | Live Donor | | | Cadaver | | |
|-------------------------------------|--------------------|------------|----|-----------------------|------------|----|------------|------------|----|---------|------------|----|
| | No. | % Survival | SE | No. | % Survival | SE | No. | % Survival | SE | No. | % Survival | SE |
| 1 | 997 | 96 | 1 | 212 | 96 | 1 | 395 | 96 | 1 | 146 | 84 | 3 |
| 3 | 770 | 92 | 1 | 174 | 90 | 2 | 312 | 95 | 1 | 104 | 79 | 3 |
| 5 | 500 | 88 | 1 | 144 | 87 | 2 | 254 | 94 | 1 | 80 | 75 | 3 |
| 10 | 161 | 82 | 2 | 86 | 70 | 4 | 91 | 91 | 2 | 7 | 70 | 4 |
| 12 | 34 | 77 | 3 | 70 | 65 | 4 | 45 | 87 | 3 | 2 | - | - |

*No.=Number at risk SE=standard error

Figure 14.5.3: Patient survival by type of transplant, 1994-2007

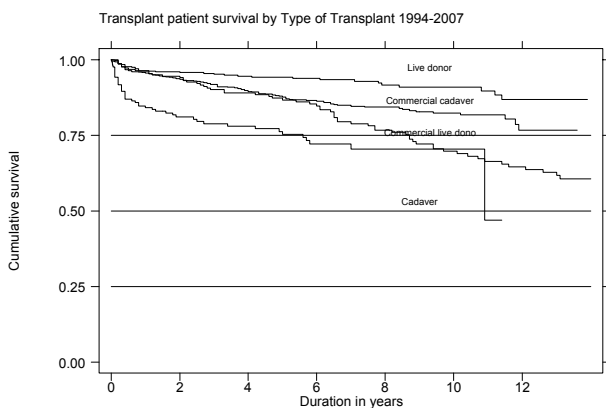


Figure 14.5.4: Graft survival by type of transplants, 1994-2007

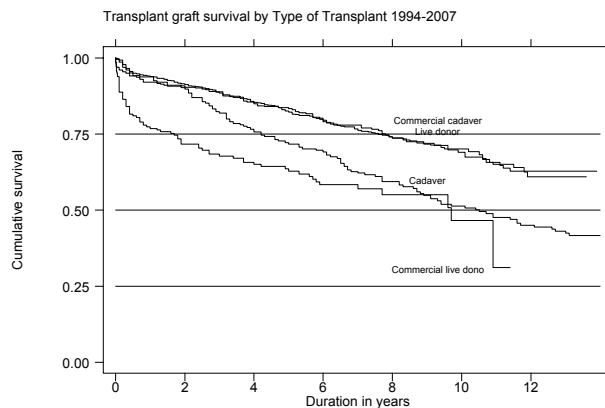


Table 14.5.4: Graft survival by type of transplant, 1994-2007

| Type of Transplant Interval (years) | Commercial Cadaver | | | Commercial Live Donor | | | Live Donor | | | Cadaver | | |
|-------------------------------------|--------------------|------------|----|-----------------------|------------|----|------------|------------|----|---------|------------|----|
| | No. | % Survival | SE | No. | % Survival | SE | No. | % Survival | SE | No. | % Survival | SE |
| 1 | 997 | 94% | 1% | 212 | 94% | 2% | 395 | 92% | 1% | 146 | 77% | 3% |
| 3 | 770 | 89% | 1% | 174 | 82% | 3% | 312 | 88% | 2% | 104 | 68% | 3% |
| 5 | 500 | 82% | 1% | 144 | 72% | 3% | 254 | 83% | 2% | 80 | 63% | 4% |
| 10 | 161 | 70% | 2% | 86 | 51% | 4% | 91 | 69% | 3% | 7 | 47% | 7% |
| 12 | 34 | 61% | 3% | 70 | 45% | 4% | 45 | 63% | 4% | 2 | . | . |

*No.=Number at risk SE=standard error

Patient and graft survival for living related transplants were compared for two cohorts. The 1994-1999 cohort and the 2000-2007 cohort were compared for patient survival (Figures 14.5.5) but both were comparable and survival remained excellent for both groups.

Graft survival for living related transplants (Figure 14.5.6) however was much better in patients in the 2000-2007 cohort even from the outset probably due to increased usage of newer immunosuppressive agents such as MMF and Tacrolimus.

Table 14.5.5: Patient survival by year of transplant (Living related transplant, 1994-2007)

| Year of Transplant Interval (years) | 1994-1999 | | | 2000-2007 | | |
|--|-----------|------------|----|-----------|------------|----|
| | No. | % Survival | SE | No. | % Survival | SE |
| 1 | 192 | 98 | 1 | 204 | 95 | 1 |
| 3 | 181 | 96 | 1 | 132 | 94 | 2 |
| 5 | 169 | 95 | 2 | 86 | 93 | 2 |
| 7 | 159 | 94 | 2 | 21 | 93 | 2 |

*No.=Number at risk

SE=standard error

Figure 14.5.5: Patient survival by year of transplant (Living related transplant, 1994-2007)

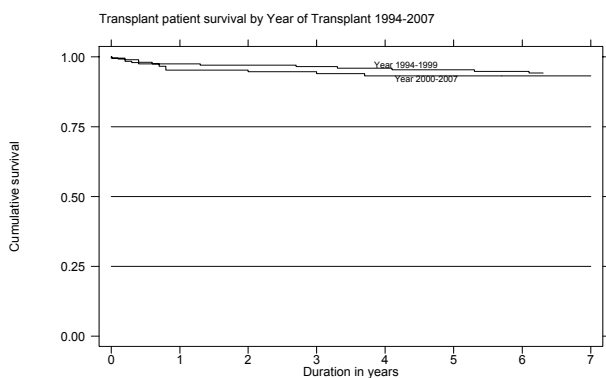


Figure 14.5.6: Graft survival by year of transplant (Living related transplant, 1994-2007)

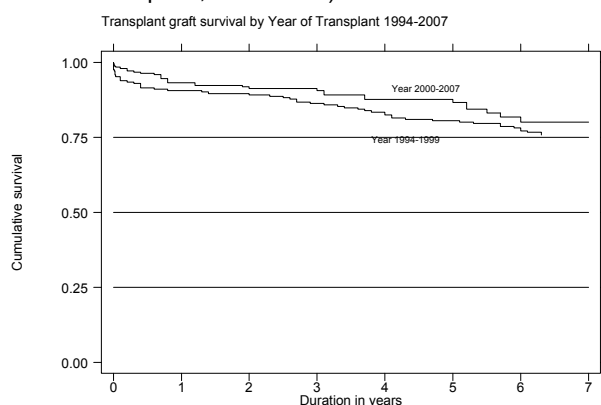


Table 14.5.6: Graft survival by year of transplant (Living related transplant, 1994-2007)

| Year of Transplant Interval (years) | 1994-1999 | | | 2000-2007 | | |
|--|-----------|------------|----|-----------|------------|----|
| | No. | % Survival | SE | No. | % Survival | SE |
| 1 | 192 | 91 | 2 | 204 | 93 | 2 |
| 3 | 181 | 86 | 2 | 132 | 91 | 2 |
| 5 | 169 | 81 | 3 | 86 | 87 | 3 |
| 7 | 159 | 76 | 3 | 21 | 80 | 4 |

In terms of commercial cadaveric transplantation, the comparison between the 1994-1999 cohort and 2000 – 2007 cohort was performed. Both patient and graft survival showed comparable results to living related transplants done within the country.

Table 14.5.7: Patient survival by year of transplant (Commercial cadaver transplant, 1994-2007)

| Year of Transplant Interval (years) | 1994-1999 | | | 2000-2007 | | |
|-------------------------------------|-----------|------------|----|-----------|------------|----|
| | No. | % Survival | SE | No. | % Survival | SE |
| 1 | 335 | 95 | 1 | 663 | 96 | 1 |
| 3 | 317 | 92 | 1 | 453 | 92 | 1 |
| 5 | 289 | 88 | 2 | 211 | 87 | 2 |
| 7 | 262 | 85 | 2 | 59 | 85 | 2 |

*No.=Number at risk SE=standard error

Figure 14.5.7: Patient survival by year of transplant (Commercial cadaver transplant, 1994-2007)

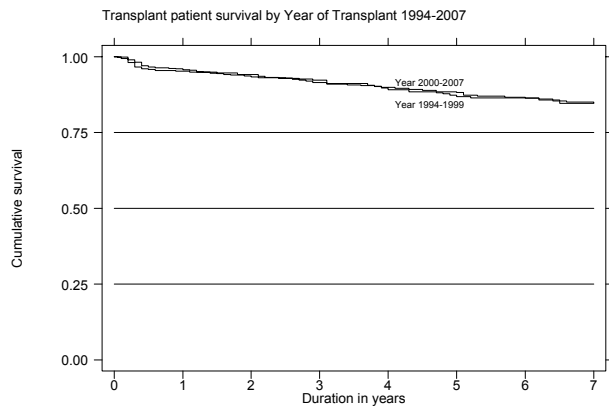


Figure 14.5.8: Graft survival by year of transplant (Commercial cadaver transplant, 1994-2007)

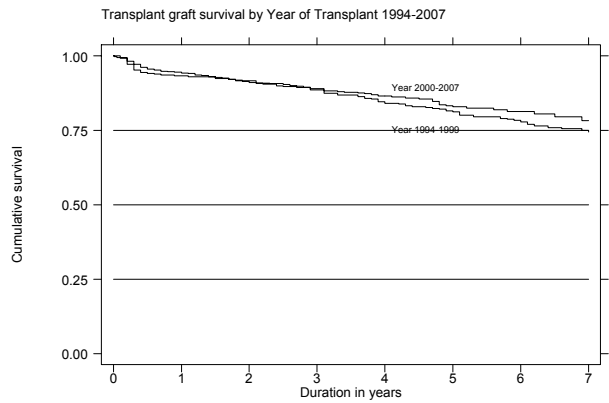


Table 14.5.8: Graft survival by year of transplant (Commercial cadaver transplant, 1994-2007)

| Year of Transplant Interval (years) | 1994-1999 | | | 2000-2007 | | |
|-------------------------------------|-----------|------------|----|-----------|------------|----|
| | No. | % Survival | SE | No. | % Survival | SE |
| 1 | 335 | 93 | 1 | 663 | 94 | 1 |
| 3 | 317 | 89 | 2 | 453 | 89 | 1 |
| 5 | 289 | 81 | 2 | 211 | 83 | 2 |
| 7 | 262 | 74 | 2 | 59 | 78 | 3 |

*No.=Number at risk SE=standard error

SECTION 14.6: CARDIOVASCULAR RISK IN RENAL TRANSPLANT RECIPIENTS

14.6.1 Risk factors for Ischaemic Heart Disease

In 2007, 89.7% of patients were hypertensive, 21.7% were diabetic and 49.8% had renal insufficiency fulfilling CKD III and above. Forty-five percent of patients had 2 cardiovascular risk factors while 8.3% had all 3 major risk factors.

Table 14.6.1: Risk factors for IHD in renal transplant recipients at year 2005, 2006 and 2007

| | 2005 | 2006 | 2007 |
|---------------------------------|------------|------------|------------|
| Diabetes | 19 (1.2) | 21 (1.4) | 25 (1.6) |
| Hypertension** | 511 (33.4) | 456 (31.2) | 590 (37.5) |
| CKD | 142 (9.3) | 177 (12.1) | 126 (8.0) |
| Diabetes + Hypertension** | 160 (10.4) | 154 (10.5) | 174 (11.1) |
| Diabetes + CKD | 20 (1.3) | 18 (1.2) | 11 (0.7) |
| CKD + Hypertension** | 538 (35.1) | 490 (33.5) | 517 (32.8) |
| Diabetes + CKD + Hypertension** | 142 (9.3) | 147 (10.0) | 131 (8.3) |

**Hypertension: BP systolic > 140 and BP diastolic > 90
OR have either Beta blocker / Calcium channel blocker / ACE inhibitor / AIIRB / Other anti-hypertensive drugs
GFR (mL/min/1.73m2) = $1.2 \cdot (140 - \text{age}(\text{year})) \cdot \text{weight}(\text{kg}) / \text{creatinine} (\mu\text{mol/L})$ if male
GFR (mL/min/1.73m2) = $0.85 \cdot (1.2 \cdot (140 - \text{age}(\text{year})) \cdot \text{weight}(\text{kg}) / \text{creatinine} (\mu\text{mol/L}))$ if female
CKD stage III-GFR, 30-60
CKD stage IV-GFR, 15-30
CKD stage V-GFR, <15

Figure 14.6.1(a); Venn Diagram for Pre and Post Transplant Complications (in %) at year 2005

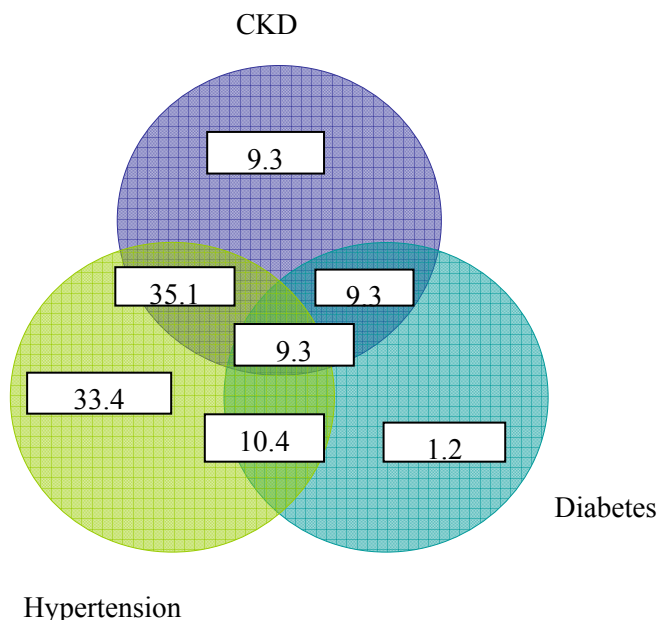


Figure 14.6.1(b); Venn Diagram for Pre and Post Transplant Complications (in %) at year 2006

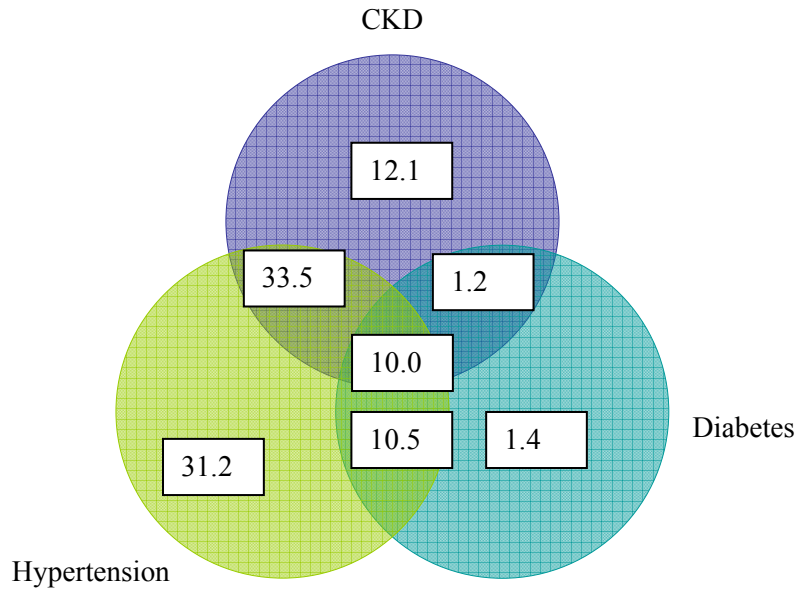
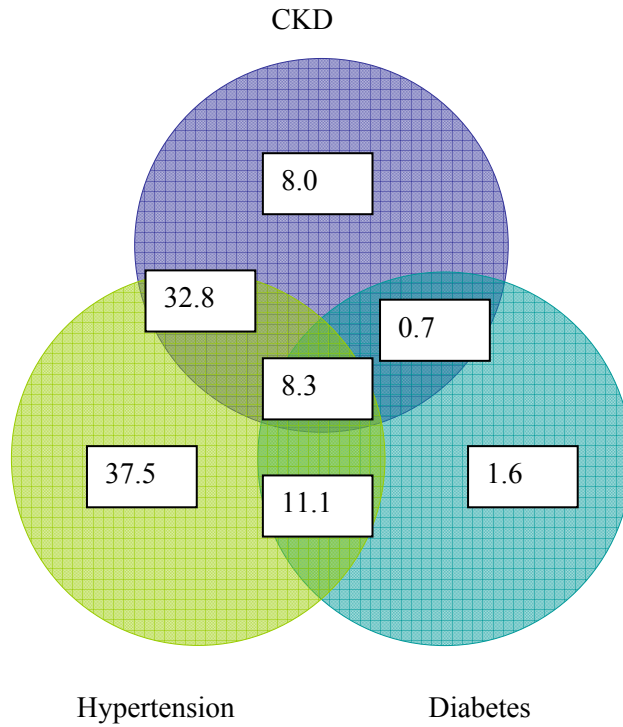


Figure 14.6.1(c); Venn Diagram for Pre and Post Transplant Complications (in %) at year 2007



14.6.2 Blood Pressure classification according to JNC VI criteria, 2005, 2006, and 2007

In 2007, 24.3% of renal transplant recipients had stage I hypertension whereas 5.9% had stage II hypertension and 1% had stage III hypertension despite being on treatment. In terms of diastolic hypertension 15.5% had stage I hypertension, 2.3% of patients had stage II diastolic hypertension and 0.3% of patients had stage III diastolic hypertension despite being on treatment.

Table 14.6.2(a): Systolic BP, 2005-2007

| Year | 2005 | | 2006 | | 2007 | |
|---------------------|------|---------|------|---------|------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| Systolic BP<120 | 233 | (14.25) | 249 | (15.64) | 239 | (14.18) |
| Systolic BP <130 | 318 | (19.45) | 395 | (24.81) | 392 | (23.26) |
| Systolic BP 130-139 | 475 | (29.05) | 483 | (30.34) | 529 | (31.39) |
| Systolic BP 140-159 | 452 | (27.65) | 353 | (22.17) | 409 | (24.27) |
| Systolic BP 160-179 | 133 | (8.13) | 93 | (5.84) | 99 | (5.88) |
| Systolic BP >=180 | 24 | (1.47) | 19 | (1.19) | 17 | (1.01) |

Figure 14.6.2(a): Systolic BP, 2005-2007

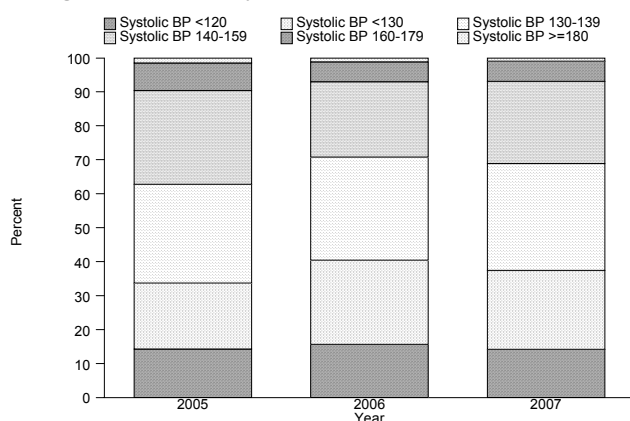


Figure 14.6.2(b): Diastolic BP, 2005-2007

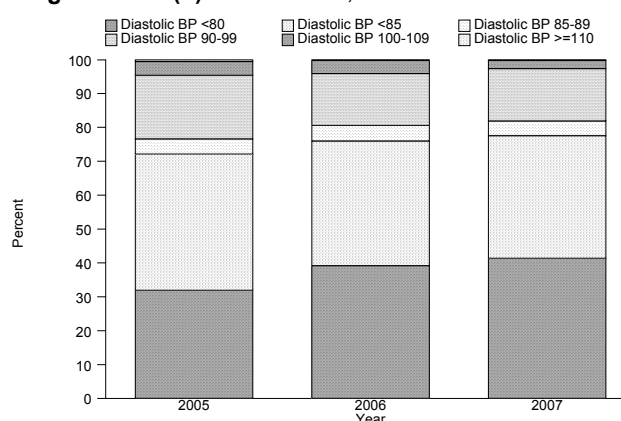


Table 14.6.2(b): Diastolic BP, 2005-2007

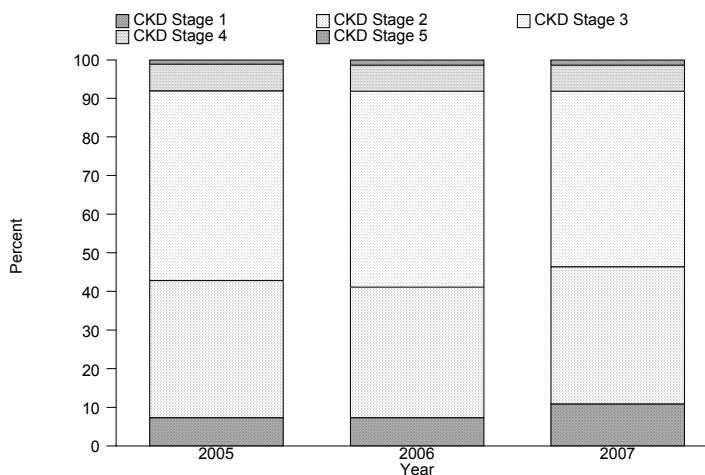
| Year | 2005 | | 2006 | | 2007 | |
|----------------------|------|---------|------|---------|------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| Diastolic BP<80 | 522 | (31.93) | 624 | (39.20) | 697 | (41.36) |
| Diastolic BP <85 | 657 | (40.18) | 586 | (36.81) | 609 | (36.14) |
| Diastolic BP 85-89 | 73 | (4.46) | 73 | (4.59) | 74 | (4.39) |
| Diastolic BP 90-99 | 308 | (18.84) | 244 | (15.33) | 261 | (15.49) |
| Diastolic BP 100-109 | 65 | (3.98) | 61 | (3.83) | 39 | (2.31) |
| Diastolic BP >=110 | 10 | (0.61) | 4 | (0.25) | 5 | (0.30) |

Table 14.6.3 shows the CKD Stage classification by year and in 2007, 45.5% of renal transplant recipients had CKD Stage III whilst another 6.8% had CKD Stage IV. CKD Stage V (impending renal replacement therapy) was found in 1.4% of renal transplant recipients.

Table 14.6.3: CKD stages, 2005-2007

| Year | 2005 | | 2006 | | 2007 | |
|-------------|------|---------|------|---------|------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| CKD stage 1 | 118 | (7.25) | 116 | (7.33) | 180 | (10.80) |
| CKD stage 2 | 579 | (35.59) | 534 | (33.73) | 593 | (35.57) |
| CKD stage 3 | 799 | (49.11) | 804 | (50.79) | 758 | (45.47) |
| CKD stage 4 | 112 | (6.88) | 107 | (6.76) | 113 | (6.78) |
| CKD stage 5 | 19 | (1.17) | 22 | (1.39) | 23 | (1.38) |

Figure 14.6.3: CKD stages by year

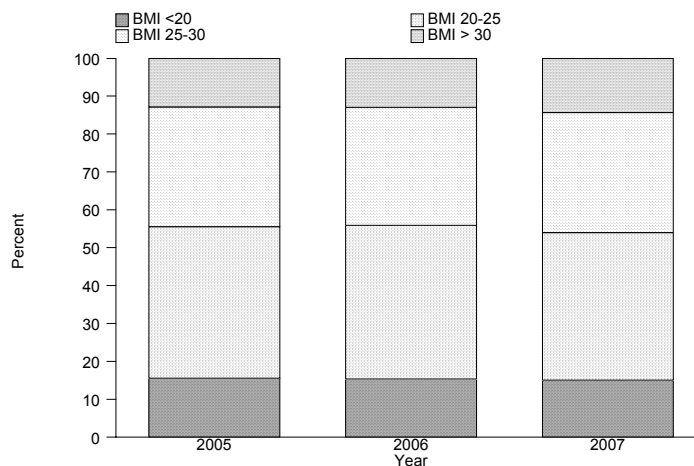


In terms of BMI for 2007, 54% of renal transplant recipients had BMIs of 25 or below. However 31.7% were overweight and 14.3% were obese. There seems to be a slow but steady increase in numbers of obese patients over the last 3 years.

Table 14.6.4: BMI, 2005-2007

| Year | 2005 | | 2006 | | 2007 | |
|-----------|------|---------|------|---------|------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| BMI <20 | 254 | (15.54) | 243 | (15.26) | 253 | (15.01) |
| BMI 20-25 | 655 | (40.06) | 646 | (40.58) | 657 | (38.99) |
| BMI 25-30 | 515 | (31.50) | 497 | (31.22) | 534 | (31.69) |
| BMI > 30 | 211 | (12.91) | 206 | (12.94) | 241 | (14.30) |

Figure 14.6.4: BMI by year

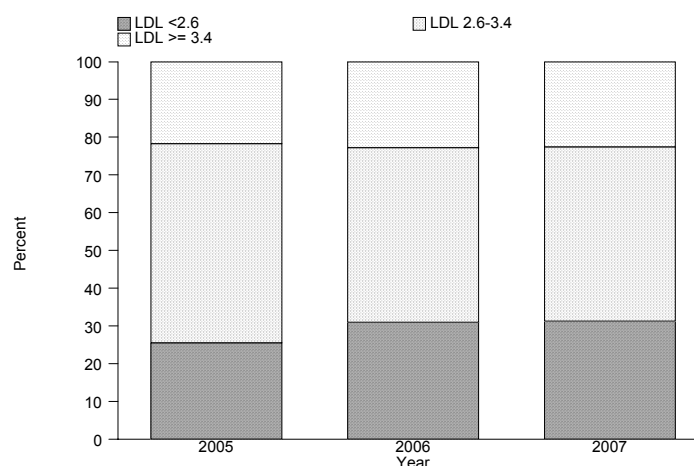


LDL cholesterol has been identified as the primary lipid target for prevention of coronary heart disease by NCEP with a log linear relationship between risk of CHD and level of LDL cholesterol. In terms of renal transplant recipients in 2007 31% have LDL levels below 2.6 mmol/l and this shows an increasing trend from 18.1% in 2004, possibly due to the more widespread use of statins. Whether or not this translates into less cardiovascular mortality in the transplant population is still questionable. Patients with serum LDL >3.4 remained fairly static during the study period at 22.6%.

Table 14.6.5(a): LDL, 2005-2007

| Year | 2005 | | 2006 | | 2007 | |
|-------------|------|---------|------|---------|------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| LDL < 2.6 | 418 | (25.57) | 492 | (30.90) | 527 | (31.28) |
| LDL 2.6-3.4 | 862 | (52.72) | 738 | (46.36) | 777 | (46.11) |
| LDL >= 3.4 | 355 | (21.71) | 362 | (22.74) | 381 | (22.61) |

Figure 14.6.5(a): LDL, 2005-2007



In terms of other cholesterol parameters for 2007, 55.6% had total cholesterol levels more than 5.2 and 6.4% had HDL cholesterol levels <1.0.

Table 14.6.5(b): Total Cholesterol, 2005-2007

| Year | 2005 | | 2006 | | 2007 | |
|----------------------------|------|---------|------|---------|------|---------|
| | No. | (%) | No. | (%) | No. | (%) |
| Total Cholesterol <4.1 | 159 | (9.72) | 160 | (10.05) | 210 | (12.46) |
| Total Cholesterol 4.1-5.1 | 455 | (27.83) | 490 | (30.78) | 539 | (31.99) |
| Total Cholesterol 5.1-6.2 | 774 | (47.34) | 700 | (43.97) | 717 | (42.55) |
| Total Cholesterol 6.2- 7.2 | 173 | (10.58) | 173 | (10.87) | 159 | (9.44) |
| Total Cholesterol > 7.2 | 74 | (4.53) | 69 | (4.33) | 60 | (3.56) |

Figure 14.6.5(b): Total Cholesterol, 2005-2007

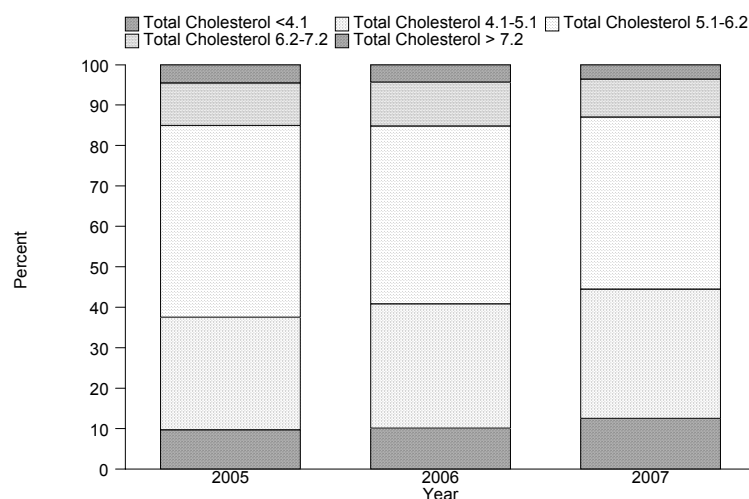


Table 14.6.5(c): HDL, 2005-2007

| Year | 2005 | | 2006 | | 2007 | |
|-----------|------|----------|------|----------|------|----------|
| | No. | (%) | No. | (%) | No. | (%) |
| HDL <1 | 118 | 7.217125 | 104 | 6.532663 | 108 | 6.409495 |
| HDL 1-1.3 | 308 | 18.83792 | 302 | 18.96985 | 350 | 20.77151 |
| HDL >1.3 | 1209 | 73.94495 | 1186 | 74.49749 | 1227 | 72.81899 |

Figure 14.6.5(c): HDL by year



Eighty-five percent of patients in 2007 were on antihypertensives and the majority were on more than 1 antihypertensive drug with 31% on 2 antihypertensives and 21% on 3 antihypertensives. Eight percent of patients still had Systolic BP of > 160 mmHg and 20% had Diastolic BP of > 90 mmHg despite given antihypertensive(s).

Table 14.6.6(a): Treatment for hypertension, 2005-2007

| Year | No. | % on anti-hypertensives | % no 1 anti-hypertensive drug | % on 2 anti-hypertensives | % on 3 anti-hypertensives |
|------|------|-------------------------|-------------------------------|---------------------------|---------------------------|
| 2005 | 1635 | 85 | 28 | 30 | 19 |
| 2006 | 1592 | 86 | 34 | 26 | 17 |
| 2007 | 1685 | 85 | 25 | 31 | 21 |

Table 14.6.6(b): Distribution of Systolic BP without anti-hypertensives, 2005-2007

| Year | No. | Mean | SD | Median | LQ | UQ | % Patients ≥ 160mmHg |
|------|-----|-------|------|--------|-----|-----|----------------------|
| 2005 | 229 | 126.9 | 15 | 130 | 120 | 137 | 3 |
| 2006 | 189 | 123.8 | 14.4 | 120 | 117 | 130 | 4 |
| 2007 | 195 | 125.3 | 16.5 | 120 | 114 | 134 | 4 |

Table 14.6.6(c): Distribution of Diastolic BP without anti-hypertensives, 2005-2007

| Year | No. | Mean | SD | Median | LQ | UQ | % patients ≥ 90mmHg |
|------|-----|------|------|--------|----|----|---------------------|
| 2005 | 229 | 79 | 9 | 80 | 70 | 80 | 18 |
| 2006 | 189 | 76.4 | 10.3 | 80 | 70 | 80 | 11 |
| 2007 | 195 | 76.6 | 10 | 80 | 70 | 80 | 12 |

Table 14.6.6(d): Distribution of Systolic BP on anti-hypertensives, 2005-2007

| Year | No. | Mean | SD | Median | LQ | UQ | % Patients ≥ 160mmHg |
|------|------|-------|------|--------|-----|-----|----------------------|
| 2005 | 1350 | 134.5 | 17.3 | 130 | 120 | 143 | 11 |
| 2006 | 1334 | 131.7 | 16.3 | 130 | 120 | 140 | 8 |
| 2007 | 1388 | 132.6 | 16 | 130 | 120 | 140 | 8 |

Table 14.6.6(e): Distribution of Diastolic BP on anti-hypertensives, 2005-2007

| Year | No. | Mean | SD | Median | LQ | UQ | % Patients ≥ 90 mmHg |
|------|------|------|-----|--------|----|----|----------------------|
| 2005 | 1350 | 80.8 | 9.4 | 80 | 76 | 90 | 25 |
| 2006 | 1334 | 79.2 | 9.9 | 80 | 70 | 86 | 22 |
| 2007 | 1387 | 79.1 | 9.6 | 80 | 70 | 85 | 20 |