

CHAPTER 9

MANAGEMENT OF RENAL BONE DISEASE IN DIALYSIS PATIENTS

Rozina Bt Ghazalli
Fan Kin Sing
Shahnaz Shah Firdaus Khan

9.1: TREATMENT OF RENAL BONE DISEASE

In 2005 no major changes were found in the treatment of renal bone disease. The majority of dialysis patients on both HD (91%) and CAPD (84%) received calcium carbonate as a phosphate binder. The usage of aluminium phosphate binders continued to be low since its sharp fall from 1997 onwards. Vitamin D was used in an increasing number of patients in the HD group (tables 9.1.1 & 9.1.2).

Table 9.1.1: Treatment for Renal Bone Disease, HD patients 1997-2005

| Year | No. of subjects | No. of subjects on CaCO ₃ | % on CaCO ₃ | No. of subjects on Al(OH) ₃ | % on Al (OH) ₃ | No. of subjects on Vitamin D | % on Vitamin D |
|------|-----------------|--------------------------------------|------------------------|--|---------------------------|------------------------------|----------------|
| 1997 | 1695 | 1543 | 91 | 417 | 25 | 694 | 41 |
| 1998 | 2141 | 1956 | 91 | 343 | 16 | 652 | 30 |
| 1999 | 2996 | 2693 | 90 | 244 | 8 | 770 | 26 |
| 2000 | 4392 | 3977 | 91 | 239 | 5 | 1084 | 25 |
| 2001 | 5194 | 4810 | 93 | 145 | 3 | 1145 | 22 |
| 2002 | 6108 | 5536 | 91 | 171 | 3 | 1375 | 23 |
| 2003 | 7043 | 6430 | 91 | 118 | 2 | 1692 | 24 |
| 2004 | 8243 | 7408 | 90 | 106 | 1 | 2029 | 25 |
| 2005 | 9255 | 8392 | 91 | 92 | 1 | 2445 | 26 |

Table 9.1.2: Treatment for Renal Bone Disease, CAPD patients 1997-2005

| Year | No. of subjects | No. of subjects on CaCO ₃ | % on CaCO ₃ | No. of subjects on Al(OH) ₃ | % on Al (OH) ₃ | No. of subjects on Vitamin D | % on Vitamin D |
|------|-----------------|--------------------------------------|------------------------|--|---------------------------|------------------------------|----------------|
| 1997 | 476 | 393 | 83 | 57 | 12 | 114 | 24 |
| 1998 | 541 | 425 | 79 | 46 | 9 | 110 | 20 |
| 1999 | 610 | 450 | 74 | 36 | 6 | 75 | 12 |
| 2000 | 662 | 522 | 79 | 15 | 2 | 96 | 15 |
| 2001 | 781 | 588 | 75 | 5 | 1 | 84 | 11 |
| 2002 | 891 | 713 | 80 | 6 | 1 | 130 | 15 |
| 2003 | 1237 | 1040 | 84 | 10 | 1 | 238 | 19 |
| 2004 | 1341 | 1125 | 84 | 18 | 1 | 304 | 23 |
| 2005 | 1403 | 1185 | 84 | 13 | 1 | 314 | 22 |

9.2: SERUM CALCIUM AND PHOSPHATE CONTROL

The median corrected serum calcium level remained at 2.3 mmol/L in HD patients (table 9.2.1 & fig 9.2.1) and 2.4 mmol/L amongst CAPD patients (table 9.2.2 & fig 9.2.2). In 2005, 59% of patients in HD and 68% of CAPD patients have achieved the target serum calcium of 2.2 to 2.6 mmol/L as required in the MOH renal replacement therapy guidelines. The percentage of patients achieving this range increased in the CAPD population but dropped slightly in the HD patients.

Table 9.2.1: Distribution of corrected Serum Calcium, HD patients 1997-2005

| Year | No. of Subjects | Mean | SD | Median | LQ | UQ | % patients ≥ 2.2 & ≤ 2.6 mmol/L |
|------|-----------------|------|----|--------|-----|-----|---|
| 1997 | 1633 | 2.3 | .3 | 2.3 | 2.2 | 2.5 | 57 |
| 1998 | 2060 | 2.3 | .3 | 2.3 | 2.2 | 2.5 | 60 |
| 1999 | 2732 | 2.3 | .3 | 2.3 | 2.2 | 2.5 | 59 |
| 2000 | 3703 | 2.4 | .3 | 2.3 | 2.2 | 2.5 | 61 |
| 2001 | 4618 | 2.4 | .2 | 2.4 | 2.2 | 2.5 | 64 |
| 2002 | 5485 | 2.3 | .3 | 2.3 | 2.2 | 2.5 | 60 |
| 2003 | 6471 | 2.3 | .2 | 2.3 | 2.2 | 2.4 | 62 |
| 2004 | 7536 | 2.3 | .2 | 2.3 | 2.2 | 2.4 | 62 |
| 2005 | 8468 | 2.3 | .2 | 2.3 | 2.1 | 2.4 | 59 |

Figure 9.2.1: Cumulative distribution of corrected Serum Calcium, HD patients 1997-2005

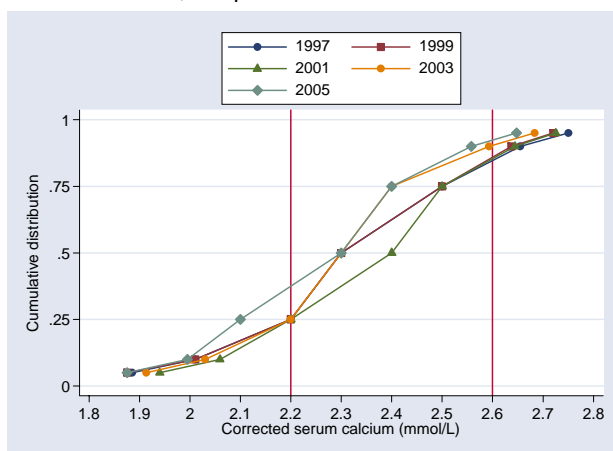


Figure 9.2.2: Cumulative distribution of corrected Serum Calcium, CAPD patients 1997-2005

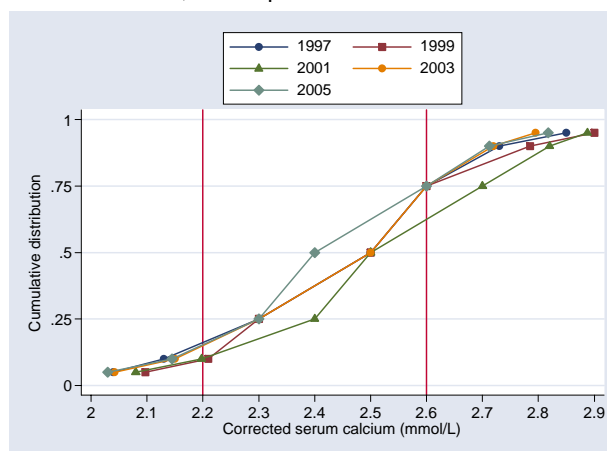


Table 9.2.2: Distribution of corrected Serum Calcium, CAPD patients 1997-2005

| Year | No. of Subjects | Mean | SD | Median | LQ | UQ | % patients ≥ 2.2 & ≤ 2.6 mmol/L |
|------|-----------------|------|----|--------|-----|-----|---|
| 1997 | 469 | 2.5 | .3 | 2.5 | 2.3 | 2.6 | 57 |
| 1998 | 535 | 2.4 | .3 | 2.4 | 2.3 | 2.6 | 59 |
| 1999 | 593 | 2.5 | .2 | 2.5 | 2.3 | 2.6 | 63 |
| 2000 | 635 | 2.5 | .2 | 2.5 | 2.3 | 2.6 | 60 |
| 2001 | 744 | 2.5 | .3 | 2.5 | 2.4 | 2.7 | 56 |
| 2002 | 859 | 2.5 | .2 | 2.5 | 2.3 | 2.6 | 63 |
| 2003 | 1169 | 2.4 | .2 | 2.5 | 2.3 | 2.6 | 62 |
| 2004 | 1277 | 2.5 | .2 | 2.5 | 2.3 | 2.6 | 66 |
| 2005 | 1337 | 2.4 | .2 | 2.4 | 2.3 | 2.6 | 68 |

The median serum phosphate levels were higher among patients on HD (1.8mmol/L) compared to CAPD patients (1.5 mmol/L) (tables and figs 9.2.3 & 9.2.4).

Table 9.2.3: Distribution of Serum Phosphate, HD patients 1997-2005

| Year | No of Subjects | Mean | SD | Median | LQ | UQ | % patients ≥ 1.6 & < 1.8 mmol/L | % patients ≥ 1.8 & < 2.2 mmol/L | % patients ≥ 2.2 & ≤ 2.6 mmol/L |
|------|----------------|------|----|--------|-----|-----|--|--|---|
| 1997 | 1649 | 1.9 | .5 | 1.9 | 1.6 | 2.3 | 16 | 27 | 19 |
| 1998 | 2051 | 1.9 | .5 | 1.9 | 1.6 | 2.2 | 16 | 33 | 17 |
| 1999 | 2861 | 1.9 | .5 | 1.9 | 1.5 | 2.2 | 15 | 28 | 18 |
| 2000 | 4080 | 1.9 | .6 | 1.8 | 1.5 | 2.2 | 16 | 29 | 15 |
| 2001 | 4765 | 1.9 | .5 | 1.8 | 1.5 | 2.2 | 17 | 27 | 16 |
| 2002 | 5679 | 1.9 | .5 | 1.8 | 1.5 | 2.2 | 17 | 27 | 17 |
| 2003 | 6593 | 1.8 | .5 | 1.8 | 1.5 | 2.2 | 17 | 26 | 15 |
| 2004 | 7620 | 1.8 | .5 | 1.8 | 1.5 | 2.2 | 17 | 25 | 15 |
| 2005 | 8657 | 1.8 | .5 | 1.7 | 1.4 | 2.1 | 17 | 25 | 13 |

Figure 9.2.3: Cumulative distribution of Serum Phosphate, HD patients 1997-2005

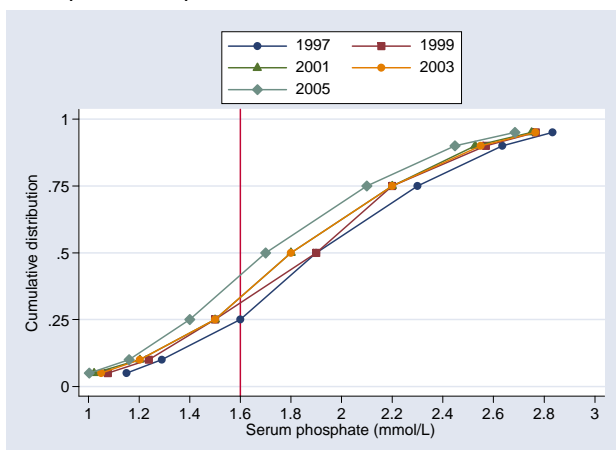


Figure 9.2.4: Cumulative distribution of Serum Phosphate, CAPD patients 1997-2005

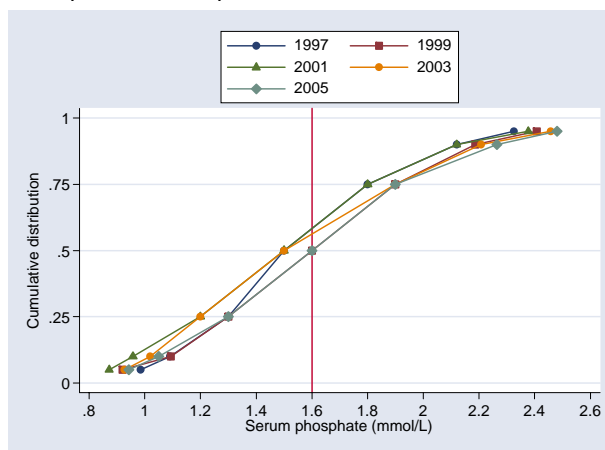


Table 9.2.4: Distribution of Serum Phosphate, CAPD patients 1997-2005

| Year | No of Subjects | Mean | SD | Median | LQ | UQ | % patients ≥ 1.6 & < 1.8 mmol/L | % patients ≥ 1.8 & < 2.2 mmol/L | % patients ≥ 2.2 & ≥ 2.6 mmol/L |
|------|----------------|------|----|--------|-----|-----|--|--|---|
| 1997 | 470 | 1.6 | .4 | 1.5 | 1.3 | 1.8 | 17 | 20 | 6 |
| 1998 | 537 | 1.6 | .5 | 1.6 | 1.3 | 1.9 | 17 | 20 | 8 |
| 1999 | 583 | 1.6 | .5 | 1.6 | 1.3 | 1.9 | 16 | 22 | 7 |
| 2000 | 633 | 1.5 | .5 | 1.5 | 1.3 | 1.8 | 14 | 19 | 6 |
| 2001 | 732 | 1.5 | .5 | 1.5 | 1.2 | 1.8 | 14 | 17 | 5 |
| 2002 | 862 | 1.5 | .5 | 1.5 | 1.2 | 1.8 | 15 | 16 | 7 |
| 2003 | 1175 | 1.6 | .5 | 1.5 | 1.2 | 1.9 | 14 | 19 | 8 |
| 2004 | 1279 | 1.6 | .5 | 1.6 | 1.3 | 1.9 | 16 | 20 | 8 |
| 2005 | 1342 | 1.6 | .5 | 1.6 | 1.3 | 1.9 | 16 | 20 | 9 |

The median corrected calcium phosphate product has declined from 4.1 mmol²/L² in 2004 to 3.9 in 2005 in HD but remained stable at 3.7 mmol²/L² in the CAPD patients (tables and figs 9.2.5 & 9.2.6). The percentage of patients within the 4 to 4.5 mmol²/L² range has remained unchanged in both groups.

Table 9.2.5: Distribution of corrected calcium x phosphate product, HD patients 1997-2005

| Year | No of Subjects | Mean | SD | Median | LQ | UQ | % patients <3.5 mmol ² /L ² | % patients >3.5 & <4 mmol ² /L ² | % patients ≥4 & <4.5 mmol ² /L ² | % patients ≥4.5 & <5 mmol ² /L ² | % patients ≥5 & <5.5 mmol ² /L ² | % patients ≥5.5 mmol ² /L ² |
|------|----------------|------|-----|--------|-----|-----|---|--|--|--|--|---|
| 1997 | 1615 | 4.5 | 1.3 | 4.5 | 3.6 | 5.3 | 23 | 14 | 15 | 17 | 12 | 20 |
| 1998 | 2020 | 4.5 | 1.2 | 4.4 | 3.7 | 5.2 | 21 | 15 | 18 | 15 | 13 | 19 |
| 1999 | 2698 | 4.4 | 1.3 | 4.3 | 3.4 | 5.2 | 27 | 14 | 15 | 14 | 11 | 18 |
| 2000 | 3650 | 4.4 | 1.3 | 4.3 | 3.5 | 5.2 | 25 | 15 | 16 | 15 | 10 | 19 |
| 2001 | 4555 | 4.3 | 1.3 | 4.2 | 3.4 | 5.2 | 27 | 16 | 16 | 13 | 11 | 18 |
| 2002 | 5403 | 4.4 | 1.3 | 4.3 | 3.4 | 5.2 | 27 | 16 | 15 | 13 | 10 | 19 |
| 2003 | 6388 | 4.2 | 1.3 | 4.1 | 3.3 | 5.1 | 30 | 16 | 15 | 13 | 10 | 16 |
| 2004 | 7414 | 4.2 | 1.3 | 4.1 | 3.3 | 5 | 32 | 16 | 15 | 12 | 10 | 15 |
| 2005 | 8350 | 4 | 1.3 | 3.9 | 3.2 | 4.8 | 36 | 17 | 15 | 11 | 9 | 12 |

Figure 9.2.5: Cumulative distribution of corrected Calcium x Phosphate product, HD patients 1997-2005

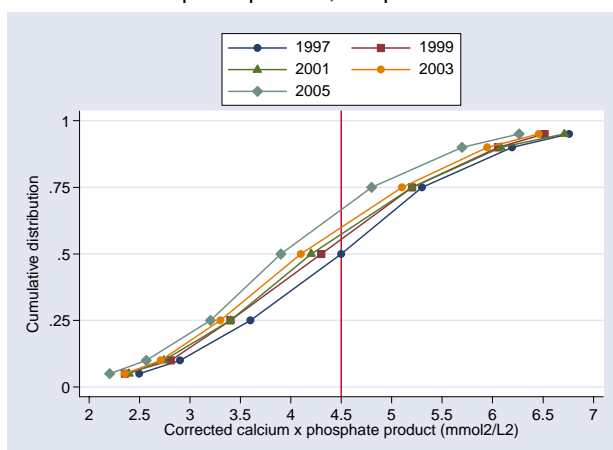


Figure 9.2.6: Cumulative distribution of corrected Calcium x Phosphate product, CAPD patients 1997-2005

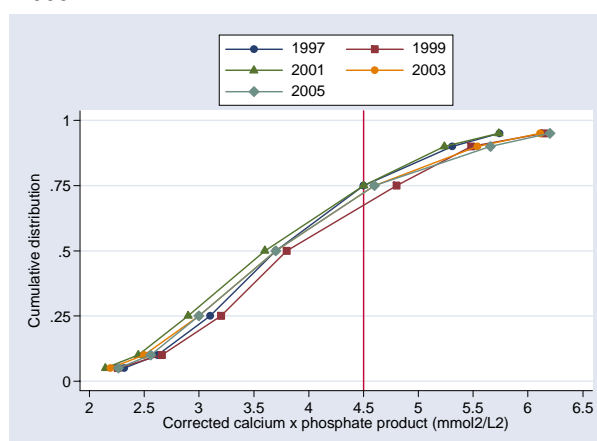


Table 9.2.6: Distribution of corrected calcium x phosphate product, CAPD patients 1997-2005

| Year | No of Subjects | Mean | SD | Median | LQ | UQ | % patients <3.5 mmol ² /L ² | % patients ≥3.5 & <4 mmol ² /L ² | % patients ≥4 & <4.5 mmol ² /L ² | % patients ≥4.5 & <5 mmol ² /L ² | % patients ≥5 & <5.5 mmol ² /L ² | % patients ≥5.5 mmol ² /L ² |
|------|----------------|------|-----|--------|-----|-----|---|--|--|--|--|---|
| 1997 | 468 | 3.9 | 1.1 | 3.7 | 3.1 | 4.5 | 40 | 20 | 15 | 10 | 6 | 7 |
| 1998 | 533 | 4 | 1.1 | 3.8 | 3.2 | 4.6 | 38 | 18 | 16 | 10 | 6 | 11 |
| 1999 | 580 | 4 | 1.2 | 3.8 | 3.2 | 4.8 | 36 | 20 | 13 | 12 | 9 | 10 |
| 2000 | 621 | 3.8 | 1.1 | 3.7 | 3.1 | 4.5 | 44 | 19 | 12 | 10 | 7 | 8 |
| 2001 | 723 | 3.8 | 1.1 | 3.6 | 2.9 | 4.5 | 46 | 18 | 12 | 10 | 8 | 7 |
| 2002 | 856 | 3.8 | 1.2 | 3.6 | 2.9 | 4.5 | 45 | 17 | 12 | 11 | 7 | 8 |
| 2003 | 1164 | 3.9 | 1.2 | 3.7 | 3 | 4.6 | 43 | 17 | 13 | 10 | 8 | 10 |
| 2004 | 1275 | 4 | 1.2 | 3.8 | 3 | 4.7 | 41 | 15 | 14 | 10 | 8 | 12 |
| 2005 | 1332 | 3.9 | 1.3 | 3.7 | 3 | 4.6 | 43 | 15 | 14 | 11 | 6 | 11 |

In 2005 the median corrected serum calcium level among HD patients from 212 centres ranged widely from as low as 1.8 to as high as 2.6 mmol/L in some centres. For CAPD patients all 18 centres had a median within the 2.2 to 2.6 mmol/L range (tables 9.2.7a and 9.2.8a).

Table 9.2.7: Variation in corrected serum calcium levels among HD centres, 2005
(a) Median serum calcium level among HD patients

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|-----|--------|-----|--------------|-----|
| 1997 | 46 | 2.1 | 2.2 | 2.3 | 2.3 | 2.4 | 2.5 | 2.5 |
| 1998 | 50 | 2 | 2.1 | 2.3 | 2.3 | 2.4 | 2.5 | 2.5 |
| 1999 | 69 | 1.5 | 2 | 2.3 | 2.3 | 2.4 | 2.5 | 2.6 |
| 2000 | 93 | 2 | 2.1 | 2.3 | 2.3 | 2.4 | 2.6 | 3.2 |
| 2001 | 116 | 2 | 2.1 | 2.3 | 2.4 | 2.4 | 2.5 | 2.6 |
| 2002 | 138 | 1.9 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 |
| 2003 | 164 | 2 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.5 |
| 2004 | 190 | 1.9 | 2.1 | 2.2 | 2.3 | 2.3 | 2.4 | 2.5 |
| 2005 | 212 | 1.8 | 2 | 2.2 | 2.3 | 2.4 | 2.4 | 2.6 |

Figure 9.2.7(a): Variation in median serum calcium level among HD patients, HD centres 2005

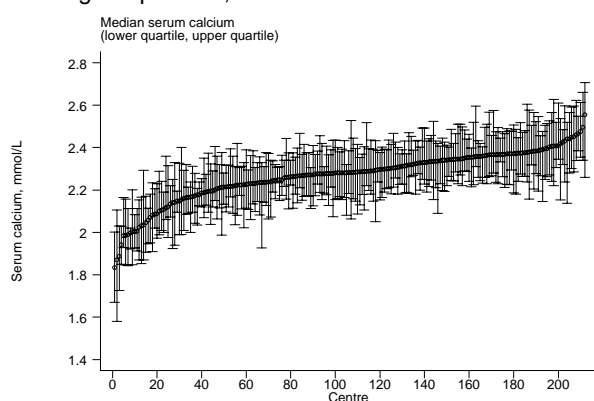
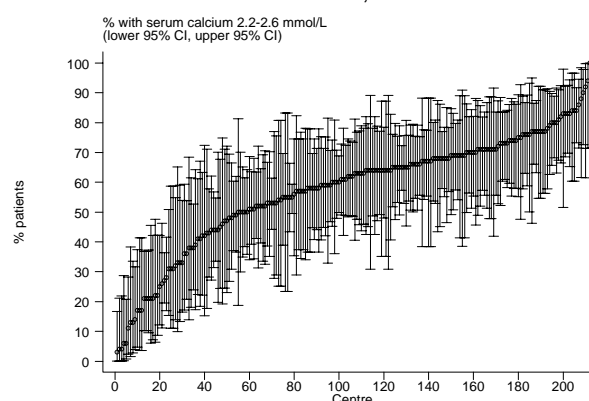


Figure 9.2.7(b): Variation in proportion of patients with serum calcium 2.2 to 2.6 mmol/L, HD centres 2005



We reviewed the proportion of patients with serum calcium range between 2.2 to 2.6 mmol/L from 1997 to 2005. The median was lower for HD centres (62.5%) (table 9.2.7b) compared to CAPD centres (64.5%) (table 9.2.8b) for the year 2005. In some HD centres less than 5% of their patients achieved a serum calcium of 2.2 to 2.6 mmol/L. The percentage of CAPD patients within a centre with serum calcium 2.2 to 2.6 mmol/L ranged from 38% to 75%.

(b) Proportion of patients with serum calcium 2.2 to 2.6 mmol/L

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|------|--------|------|--------------|-----|
| 1997 | 46 | 23 | 36 | 50 | 57.5 | 63 | 72 | 76 |
| 1998 | 50 | 22 | 30 | 51 | 63 | 71 | 82 | 94 |
| 1999 | 69 | 8 | 20 | 49 | 60 | 70 | 81 | 94 |
| 2000 | 93 | 0 | 25 | 52 | 62 | 69 | 79 | 100 |
| 2001 | 116 | 16 | 28 | 57 | 64 | 71 | 85 | 98 |
| 2002 | 138 | 0 | 25 | 49 | 62 | 70 | 81 | 92 |
| 2003 | 164 | 9 | 30 | 53.5 | 63 | 70.5 | 81 | 91 |
| 2004 | 190 | 5 | 25 | 50 | 63 | 73 | 83 | 91 |
| 2005 | 212 | 3 | 17 | 49 | 62.5 | 70 | 83 | 100 |

Table 9.2.8: Variation in corrected serum calcium levels among CAPD centres, 2005

(a) Median serum calcium level among CAPD patients

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|-----|--------|-----|--------------|-----|
| 1997 | 7 | 2.1 | 2.1 | 2.4 | 2.4 | 2.5 | 2.6 | 2.6 |
| 1998 | 9 | 2.2 | 2.2 | 2.3 | 2.4 | 2.4 | 2.6 | 2.6 |
| 1999 | 10 | 2.4 | 2.4 | 2.4 | 2.5 | 2.6 | 2.6 | 2.6 |
| 2000 | 11 | 2.4 | 2.4 | 2.4 | 2.5 | 2.5 | 2.6 | 2.6 |
| 2001 | 12 | 2.3 | 2.3 | 2.4 | 2.5 | 2.5 | 2.6 | 2.6 |
| 2002 | 14 | 2.4 | 2.4 | 2.4 | 2.5 | 2.5 | 2.6 | 2.6 |
| 2003 | 18 | 2.3 | 2.3 | 2.4 | 2.4 | 2.5 | 2.6 | 2.6 |
| 2004 | 18 | 2.3 | 2.3 | 2.4 | 2.4 | 2.5 | 2.5 | 2.5 |
| 2005 | 18 | 2.2 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.6 |

Figure 9.2.8(a): Variation in median serum calcium level among CAPD patients, CAPD centres 2005

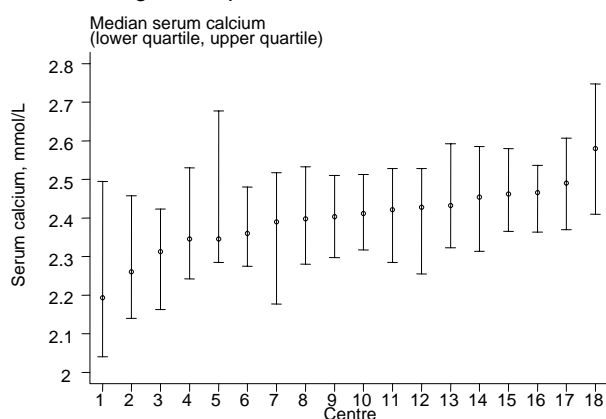
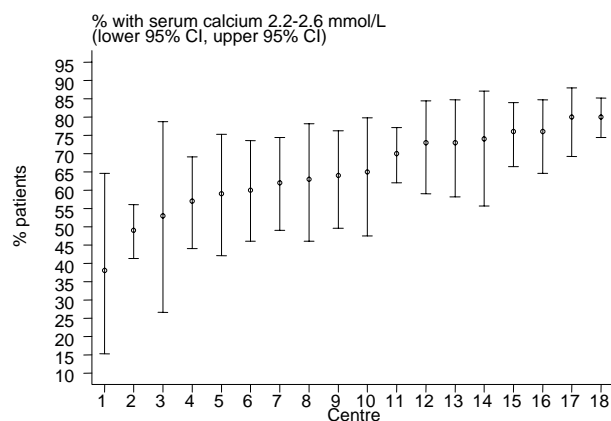


Figure 9.2.8(b): Variation in proportion of patients with serum calcium 2.2 to 2.6 mmol/L, CAPD centres 2005



(b) Proportion of patients with serum calcium 2.2 to 2.6 mmol/L

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|----|--------|------|--------------|-----|
| 1997 | 7 | 34 | 34 | 35 | 59 | 67 | 71 | 71 |
| 1998 | 9 | 43 | 43 | 47 | 55 | 60 | 78 | 78 |
| 1999 | 10 | 36 | 36 | 53 | 58 | 62 | 82 | 82 |
| 2000 | 11 | 45 | 45 | 48 | 57 | 70 | 83 | 83 |
| 2001 | 12 | 45 | 45 | 54 | 57.5 | 60.5 | 69 | 69 |
| 2002 | 14 | 50 | 50 | 56 | 68.5 | 71 | 73 | 73 |
| 2003 | 18 | 41 | 41 | 57 | 64 | 69 | 76 | 76 |
| 2004 | 18 | 45 | 45 | 61 | 68 | 75 | 80 | 80 |
| 2005 | 18 | 38 | 38 | 59 | 64.5 | 74 | 80 | 80 |

In reviewing the proportion of patients with a serum phosphate level below 1.6 mmol/L the CAPD centres have a higher median proportion of patients with serum phosphate level below 1.6 mmol/L (52.5%) compared to HD centres (37%) (tables 9.2.9a & 9.2.9b). However since 2002 the trend shows an increasing proportion of HD patients is achieving a serum phosphate of <1.6 mmol/L.

Table 9.2.9: Variation in serum phosphate levels among HD centres, 2005
(a) Median serum phosphate level among HD patients

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|-----|--------|-----|--------------|-----|
| 1997 | 46 | 1.3 | 1.5 | 1.8 | 1.9 | 2.1 | 2.3 | 2.8 |
| 1998 | 50 | 1.5 | 1.5 | 1.8 | 1.9 | 2.1 | 2.2 | 2.6 |
| 1999 | 71 | 1.1 | 1.6 | 1.8 | 1.9 | 2 | 2.1 | 2.1 |
| 2000 | 100 | 1.4 | 1.6 | 1.7 | 1.9 | 1.9 | 2.2 | 3.8 |
| 2001 | 117 | 1.3 | 1.5 | 1.7 | 1.8 | 1.9 | 2.1 | 2.3 |
| 2002 | 145 | 1.3 | 1.5 | 1.8 | 1.9 | 2 | 2.2 | 2.4 |
| 2003 | 169 | .9 | 1.5 | 1.7 | 1.8 | 1.9 | 2.2 | 2.4 |
| 2004 | 191 | 1.4 | 1.5 | 1.7 | 1.8 | 1.9 | 2.1 | 2.2 |
| 2005 | 218 | .9 | 1.4 | 1.6 | 1.8 | 1.9 | 2.1 | 2.2 |

Figure 9.2.9(a): Variation in median serum phosphate level among HD patients, HD centres 2005

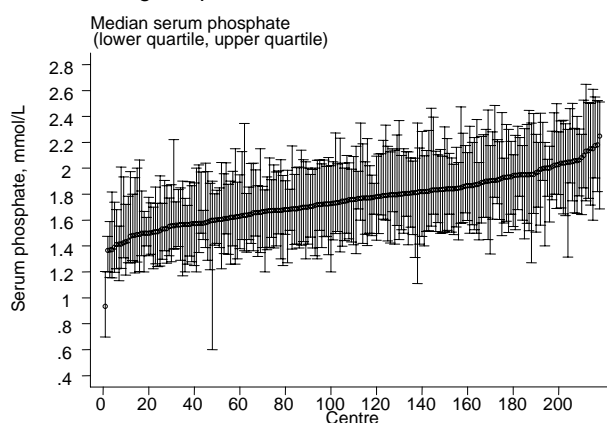
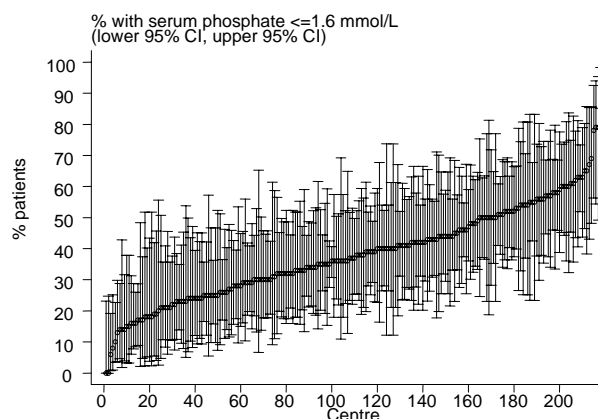


Figure 9.2.9(b): Variation in proportion of patients with serum phosphate <=1.6 mmol/L among HD centres 2005



(b) Proportion of patients with serum phosphate ≤ 1.6 mmol/L

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|----|--------|------|--------------|-----|
| 1997 | 46 | 0 | 10 | 17 | 25.5 | 38 | 55 | 71 |
| 1998 | 50 | 0 | 7 | 17 | 22 | 30 | 54 | 59 |
| 1999 | 71 | 6 | 10 | 21 | 29 | 39 | 55 | 81 |
| 2000 | 100 | 0 | 13 | 21 | 31 | 38.5 | 50.5 | 66 |
| 2001 | 117 | 0 | 11 | 23 | 30 | 38 | 57 | 77 |
| 2002 | 145 | 0 | 8 | 21 | 28 | 36 | 58 | 76 |
| 2003 | 169 | 5 | 13 | 22 | 31 | 40 | 56 | 89 |
| 2004 | 191 | 0 | 11 | 23 | 33 | 44 | 60 | 95 |
| 2005 | 218 | 0 | 15 | 27 | 37 | 49 | 63 | 94 |

Table 9.2.10: Variation in serum phosphate levels among CAPD centres, 2005
(a) Median serum phosphate level among CAPD patients

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|-----|--------|-----|--------------|-----|
| 1997 | 7 | 1.4 | 1.4 | 1.5 | 1.5 | 1.6 | 1.7 | 1.7 |
| 1998 | 9 | 1.4 | 1.4 | 1.5 | 1.6 | 1.6 | 1.8 | 1.8 |
| 1999 | 9 | 1.5 | 1.5 | 1.5 | 1.6 | 1.6 | 1.7 | 1.7 |
| 2000 | 11 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.8 | 1.8 |
| 2001 | 12 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.9 | 1.9 |
| 2002 | 14 | 1.4 | 1.4 | 1.4 | 1.5 | 1.6 | 2.1 | 2.1 |
| 2003 | 18 | 1.1 | 1.1 | 1.4 | 1.5 | 1.6 | 1.7 | 1.7 |
| 2004 | 18 | 1.4 | 1.4 | 1.4 | 1.5 | 1.6 | 1.8 | 1.8 |
| 2005 | 18 | 1.4 | 1.4 | 1.5 | 1.5 | 1.6 | 1.9 | 1.9 |

Figure 9.2.10(a): Variation in median serum phosphate level among CAPD patients, CAPD centres 2005

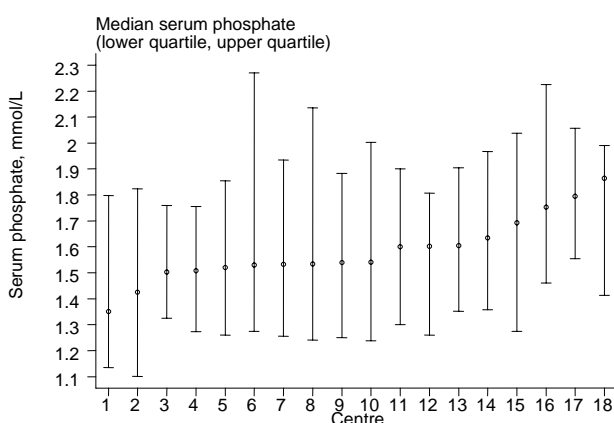
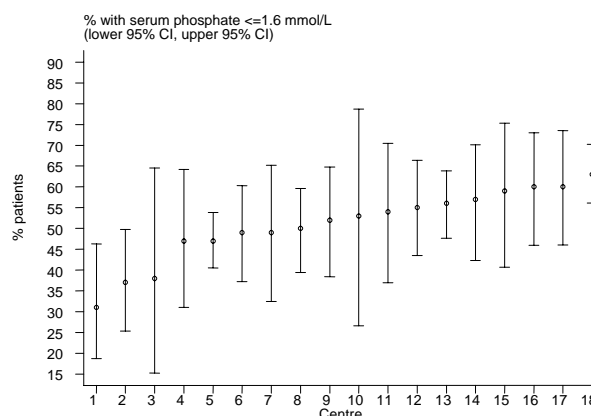


Figure 9.2.10(b): Variation in proportion of patients with serum phosphate ≤ 1.6 mmol/L, CAPD centres 2005



(b) Proportion of patients with serum phosphate ≤ 1.6 mmol/L

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|----|--------|----|--------------|-----|
| 1997 | 7 | 24 | 24 | 53 | 54 | 63 | 75 | 75 |
| 1998 | 9 | 37 | 37 | 49 | 53 | 54 | 67 | 67 |
| 1999 | 9 | 41 | 41 | 49 | 53 | 56 | 57 | 57 |
| 2000 | 11 | 29 | 29 | 48 | 54 | 66 | 73 | 73 |
| 2001 | 12 | 30 | 30 | 48 | 59 | 65 | 72 | 72 |
| 2002 | 14 | 36 | 36 | 51 | 55.5 | 61 | 72 | 72 |
| 2003 | 18 | 33 | 33 | 49 | 56.5 | 67 | 75 | 75 |
| 2004 | 18 | 34 | 34 | 44 | 55.5 | 61 | 76 | 76 |
| 2005 | 18 | 31 | 31 | 47 | 52.5 | 57 | 63 | 63 |

A higher number of CAPD centres have median calcium phosphate product less than $4.5 \text{ mmol}^2/\text{L}^2$ as compared to HD centres (73.5% versus 69%). In 2005 more than half of the CAPD patients in all the 18 CAPD centres were able to achieve a calcium phosphate product of $<4.5 \text{ mmol}^2/\text{L}^2$. Nevertheless there is an increasing trend among HD centres achieving a corrected calcium phosphate product less than $4.5 \text{ mmol}^2/\text{L}^2$ (tables and figs 9.2.11 & 9.2.12). In some HD centres 90% of their patients achieved a calcium phosphate product of $<4.5 \text{ mmol}^2/\text{L}^2$.

Table 9.2.11: Variation in corrected calcium x phosphate product among HD centres, 2005
(a) Median corrected calcium x phosphate product among HD patients

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|-----|--------|-----|--------------|-----|
| 1997 | 46 | 2.9 | 3.7 | 4.1 | 4.4 | 4.8 | 5.3 | 6.2 |
| 1998 | 50 | 3.2 | 3.3 | 4.1 | 4.5 | 4.7 | 5.3 | 5.3 |
| 1999 | 69 | 2.3 | 3.1 | 4 | 4.3 | 4.7 | 5.2 | 5.2 |
| 2000 | 91 | 3.1 | 3.7 | 4 | 4.3 | 4.6 | 5.2 | 6.2 |
| 2001 | 113 | 2.9 | 3.6 | 3.9 | 4.2 | 4.6 | 5 | 5.7 |
| 2002 | 138 | 2.9 | 3.5 | 3.9 | 4.3 | 4.6 | 5.2 | 6.2 |
| 2003 | 164 | 2.1 | 3.4 | 3.8 | 4.1 | 4.5 | 5 | 5.7 |
| 2004 | 189 | 2.9 | 3.3 | 3.8 | 4.1 | 4.3 | 5 | 5.5 |
| 2005 | 210 | 2.1 | 3.2 | 3.6 | 3.9 | 4.3 | 4.8 | 5.1 |

Figure 9.2.11(a): Variation in median corrected calcium x phosphate product among HD patients, HD centres

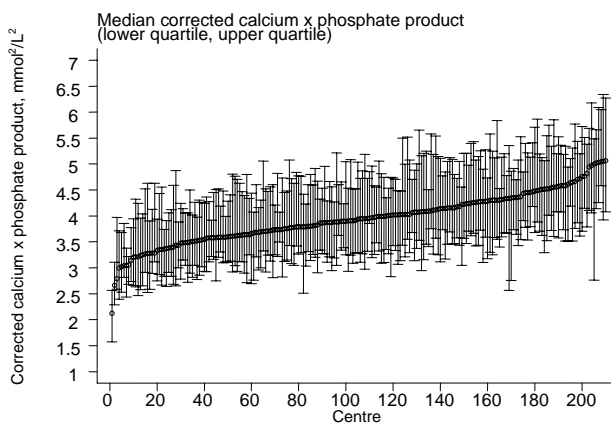
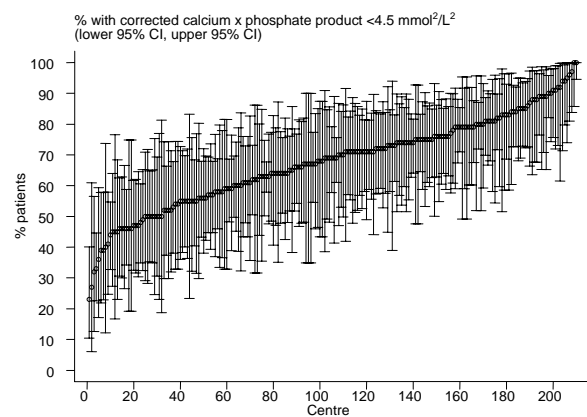


Figure 9.2.11(b): Variation in proportion of patients with corrected calcium x phosphate product $<4.5 \text{ mmol}^2/\text{L}^2$, HD centres 2005



(b) Proportion of patients with corrected calcium x phosphate product $<4.5 \text{ mmol}^2/\text{L}^2$

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|----|--------|------|--------------|-----|
| 1997 | 46 | 15 | 26 | 39 | 51.5 | 66 | 77 | 100 |
| 1998 | 50 | 20 | 27 | 40 | 52 | 64 | 83 | 91 |
| 1999 | 69 | 20 | 31 | 47 | 55 | 65 | 95 | 100 |
| 2000 | 91 | 12 | 33 | 48 | 58 | 67 | 80 | 88 |
| 2001 | 113 | 18 | 38 | 48 | 55 | 71 | 82 | 91 |
| 2002 | 138 | 14 | 31 | 48 | 57 | 69 | 88 | 100 |
| 2003 | 164 | 21 | 32 | 50 | 61.5 | 72.5 | 85 | 100 |
| 2004 | 189 | 21 | 36 | 54 | 64 | 74 | 89 | 100 |
| 2005 | 210 | 23 | 45 | 57 | 69 | 79 | 91 | 100 |

Table 9.2.12: Variation in corrected calcium x phosphate product among CAPD centres, 2005

(a) Median corrected calcium x phosphate product among CAPD patients

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|-----|--------|-----|--------------|-----|
| 1997 | 7 | 3.5 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9 | 3.9 |
| 1998 | 9 | 3.5 | 3.5 | 3.6 | 3.7 | 3.9 | 4 | 4 |
| 1999 | 9 | 3.6 | 3.6 | 3.7 | 3.9 | 4.1 | 4.2 | 4.2 |
| 2000 | 11 | 3.4 | 3.4 | 3.5 | 3.7 | 4 | 4.4 | 4.4 |
| 2001 | 12 | 3.1 | 3.1 | 3.4 | 3.7 | 4 | 4.3 | 4.3 |
| 2002 | 14 | 3.4 | 3.4 | 3.4 | 3.7 | 4 | 4.9 | 4.9 |
| 2003 | 18 | 2.7 | 2.7 | 3.4 | 3.6 | 3.9 | 4.1 | 4.1 |
| 2004 | 18 | 3.2 | 3.2 | 3.5 | 3.8 | 4 | 4.4 | 4.4 |
| 2005 | 18 | 3.3 | 3.3 | 3.5 | 3.7 | 3.9 | 4.2 | 4.2 |

Figure 9.2.12(a): Variation in median corrected calcium x phosphate product among CAPD patients, CAPD centres 2005

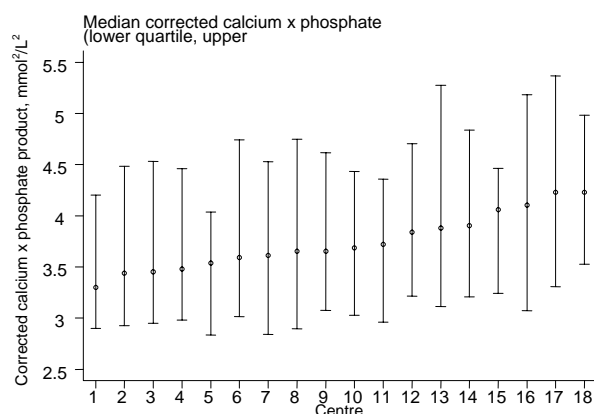
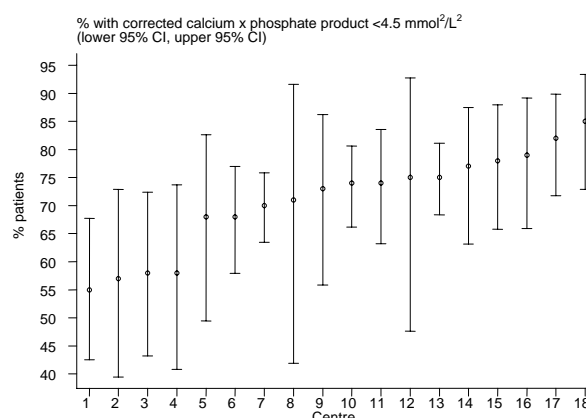


Figure 9.2.12(b): Variation in proportion of patients with corrected calcium x phosphate product < 4.5 mmol²/L², CAPD centres 2005



(b) Proportion of patients with corrected calcium x phosphate product < 4.5 mmol²/L²

| Year | No. of centres | Min | 5th Centile | LQ | Median | UQ | 95th Centile | Max |
|------|----------------|-----|-------------|------|--------|----|--------------|-----|
| 1997 | 7 | 70 | 70 | 74 | 78 | 82 | 94 | 94 |
| 1998 | 9 | 66 | 66 | 71 | 73 | 79 | 91 | 91 |
| 1999 | 9 | 59 | 59 | 65 | 72 | 74 | 77 | 77 |
| 2000 | 11 | 59 | 59 | 70 | 73 | 81 | 85 | 85 |
| 2001 | 12 | 50 | 50 | 71.5 | 76 | 79 | 84 | 84 |
| 2002 | 14 | 43 | 43 | 65 | 74.5 | 82 | 88 | 88 |
| 2003 | 18 | 62 | 62 | 67 | 74 | 81 | 100 | 100 |
| 2004 | 18 | 56 | 56 | 66 | 72 | 78 | 91 | 91 |
| 2005 | 18 | 55 | 55 | 68 | 73.5 | 77 | 85 | 85 |

Conclusion

In 2005 calcium carbonate remains the major phosphate binder in both HD and CAPD patients. Phosphate control continues to be better in the CAPD group. The target of calcium phosphate product of less than $4.5 \text{ mmol}^2/\text{L}^2$ is achieved more by CAPD patients than HD although there is an increasing trend among HD centres achieving a corrected calcium phosphate product less than $4.5 \text{ mmol}^2/\text{L}^2$. Continued differences in dialysis management have resulted in variation of outcome results in serum calcium, phosphate and calcium phosphate product.

The relationship of these factors to increased cardiovascular mortality in our patients has not been determined. It is hoped that in future reports this can be studied. It is also necessary to look at intact parathyroid hormone levels (iPTH) in the context of renal bone disease and cardiovascular disease. With the use of newer phosphate binders and vitamin D compounds in the coming years better control of bone disease is to be expected.