

## Chapter 10: Blood Pressure

### **Introduction**

The Renal Association Standards Document recommends similar blood pressure control for haemodialysis and peritoneal dialysis patients, although no standard is recommended for transplant patients. The standards for systolic and diastolic blood pressure vary in relation to age, although available evidence does not support this. Hypertension is of greater prognostic significance in the elderly because of their markedly higher background risk (Lever and Ramsay). Studies such as the HOT study (Hansson et al) show benefits from treating the elderly similarly to younger patients. The WHO/ISH (Guidelines subcommittee) and the British Hypertension Society guidelines (Ramsay et al) adopt the same treatment thresholds and targets for the elderly as for younger patients. Hypertension, especially systolic hypertension, is generally considered to be more frequent and more difficult to control in older people. The standards are:

*Age <60: BP < 140/90 mmHg. (predialysis for haemodialysis patients)*  
*Age >60: BP < 160/90 mmHg. (predialysis for haemodialysis patients)*  
*(Korotkoff V if auscultation is used)*

These standards are equivalent to a mean arterial pressure of 106.7 and 113.3 respectively.

Whilst it is generally accepted that very low blood pressures are a poor prognostic sign in dialysis patients, the significance of high pressures is less certain. In many studies of dialysis patients raised blood pressure is not necessarily associated with poor outcome (Duranti et al, Foley et al, Iseki et al, Port et al, Salem) possibly because of the cardio-protective effects of many of the hypotensive agents prescribed for such patients. Post dialysis blood pressure may also be of importance (Port et al), but the Registry, although collecting this, is not currently analysing this. It is not clear which of systolic, diastolic, or mean arterial pressure is the best indicator of prognosis. The Registry data are presented by achievement of the standard for combined systolic and diastolic pressure, and then in terms of systolic and diastolic pressures separately, and finally mean arterial pressure.

### **Results**

The data are displayed in figures 10.1 – 10.24.

These are clearly difficult standards to attain. As expected the blood pressures of haemodialysis patients are higher than those of peritoneal dialysis patients. In many units the median blood pressure of older and younger patients is similar, but as the standard is more liberal for older patients there is better attainment of the standard in this age group. Thus for haemodialysis patients only about 40% of those aged under 60

have a blood pressure within the recommended standard, and 60% of those over 60. For peritoneal dialysis patients the respective figures are 49% and 68%.

## Achievement of combined systolic and diastolic standard

### Haemodialysis

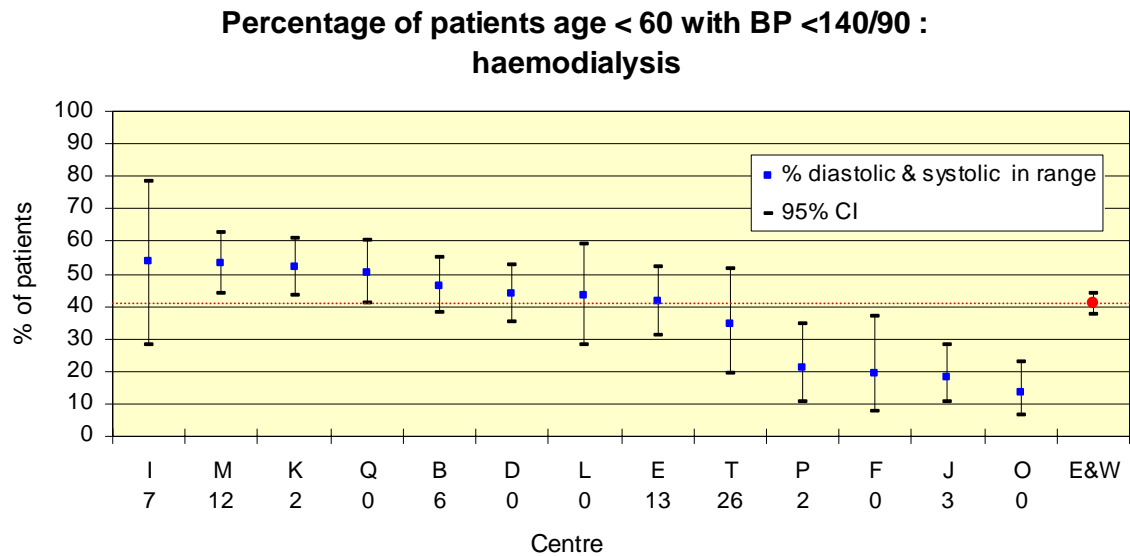


Figure 10.1 Percentage of patients age < 60 with BP < 140/90 on haemodialysis

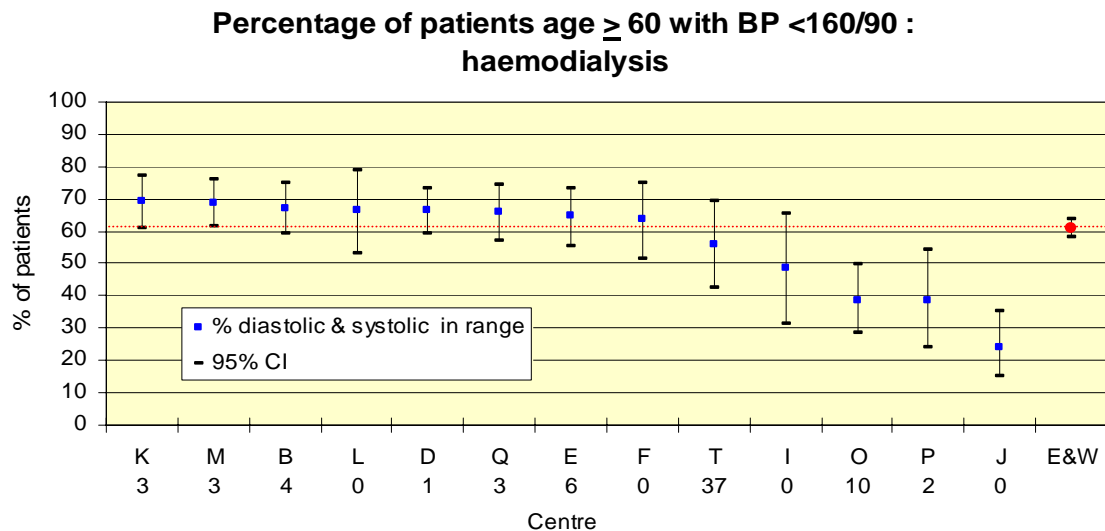
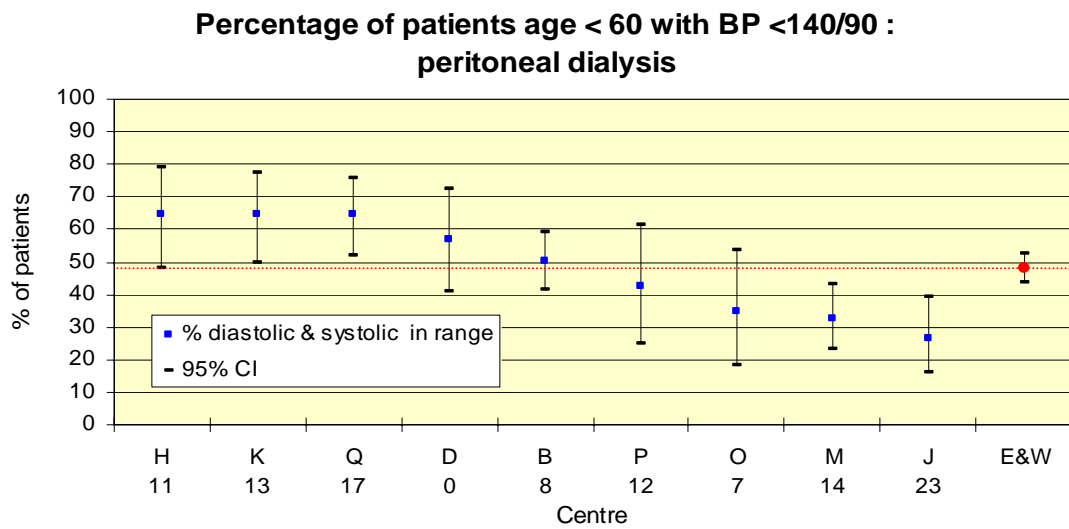
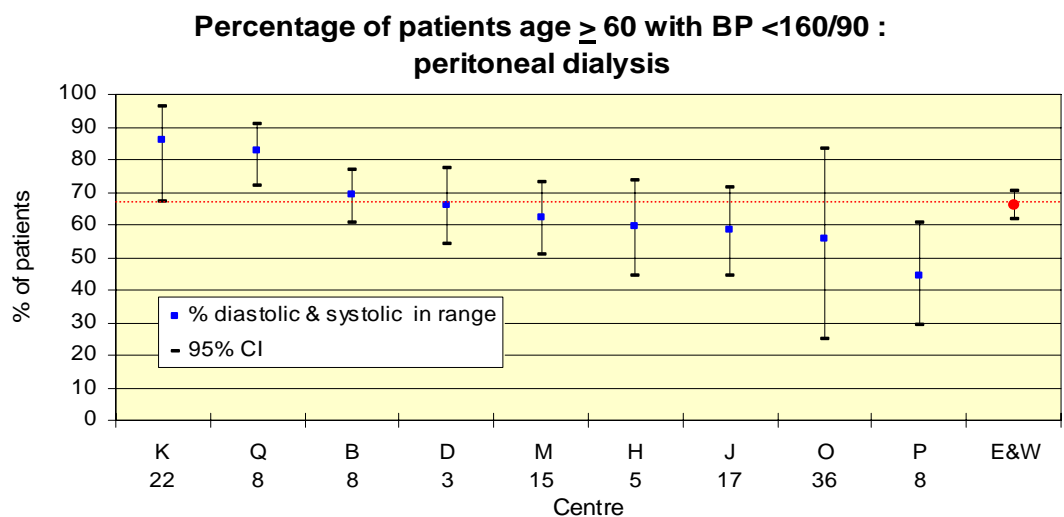


Figure 10.2 Percentage of patients age ≥ 60 with BP < 160/90 on haemodialysis

## Peritoneal dialysis



**Figure 10.3** Percentage of patients age < 60 with BP < 140/90 on peritoneal dialysis



**Figure 10.4** Percentage of patients age  $\geq$  60 with BP < 160/90 on peritoneal dialysis

## Systolic pressure alone

### Haemodialysis

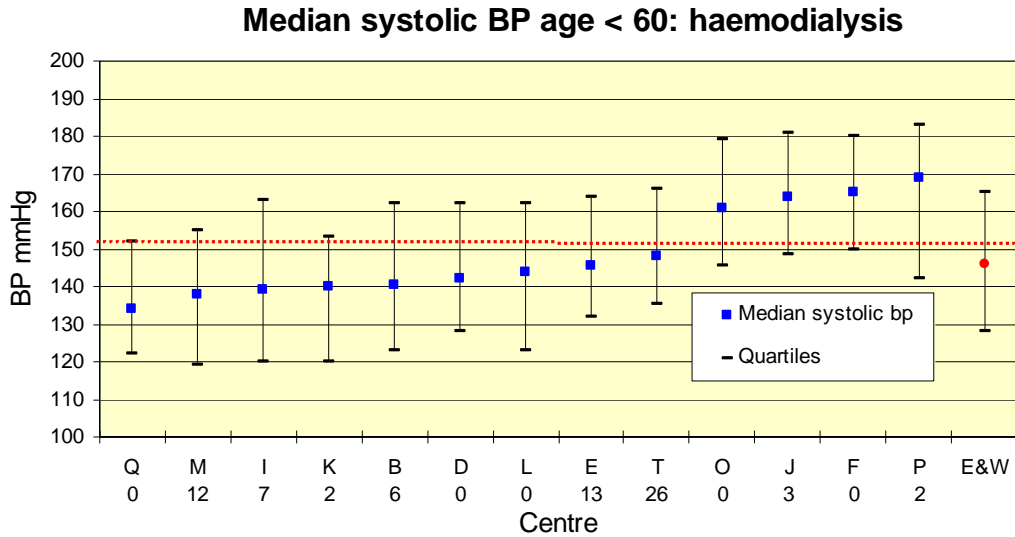


Figure 10.5 Median systolic blood pressure age < 60 on haemodialysis

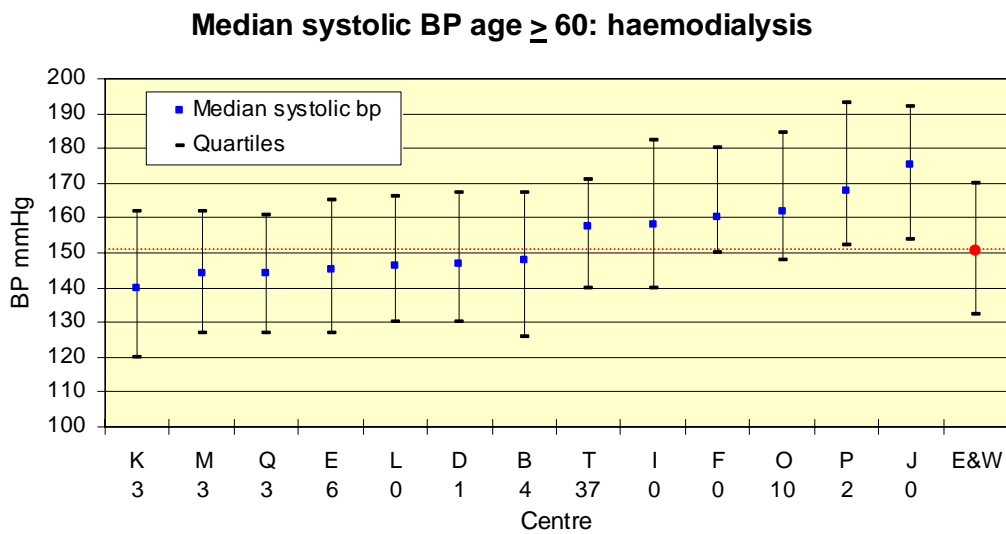
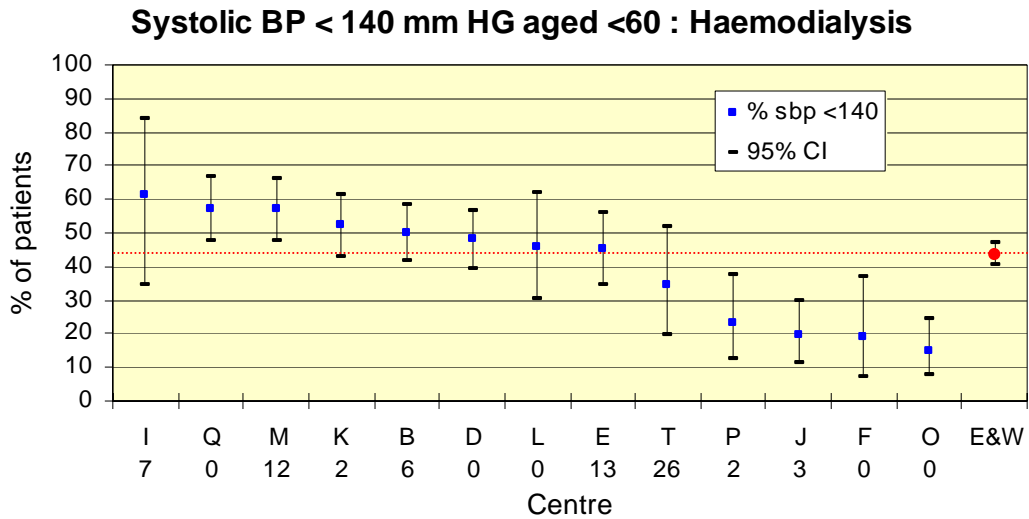
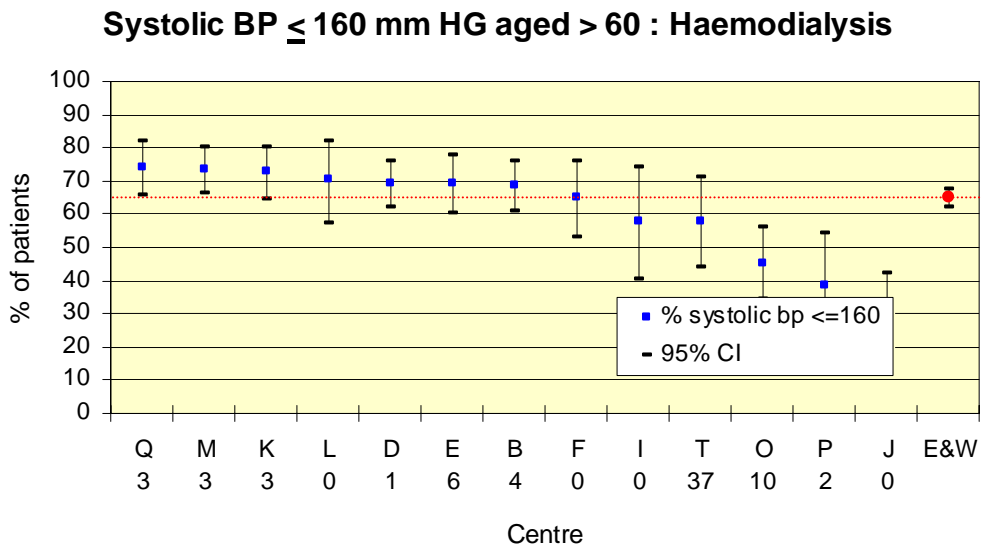


Figure 10.6 Median systolic blood pressure age ≥ 60 on haemodialysis



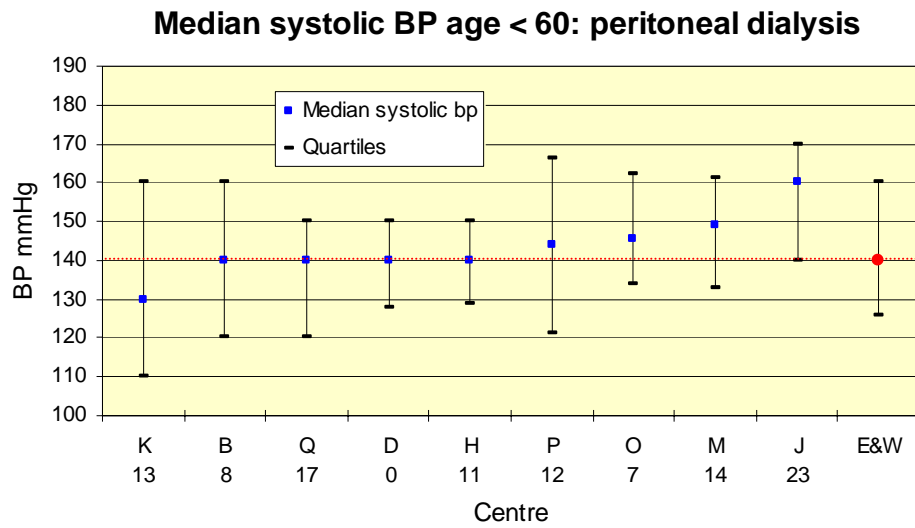
**Figure 10.7** Percentage of patients with systolic BP < 140 mm Hg aged < 60 on haemodialysis



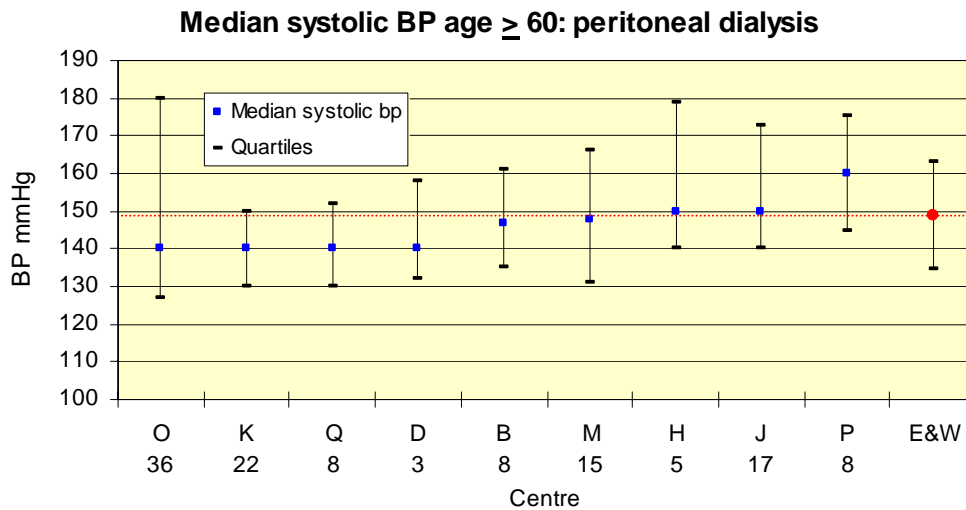
**Figure 10.8** Percentage of patients with systolic BP ≤ 160 mm Hg aged > 60 on haemodialysis

There is little difference in systolic blood pressure control achieved in haemodialysis patients in the two age groups, with only 3mmHg. difference between the Registry median systolic pressure for those above and below age the age of 60.

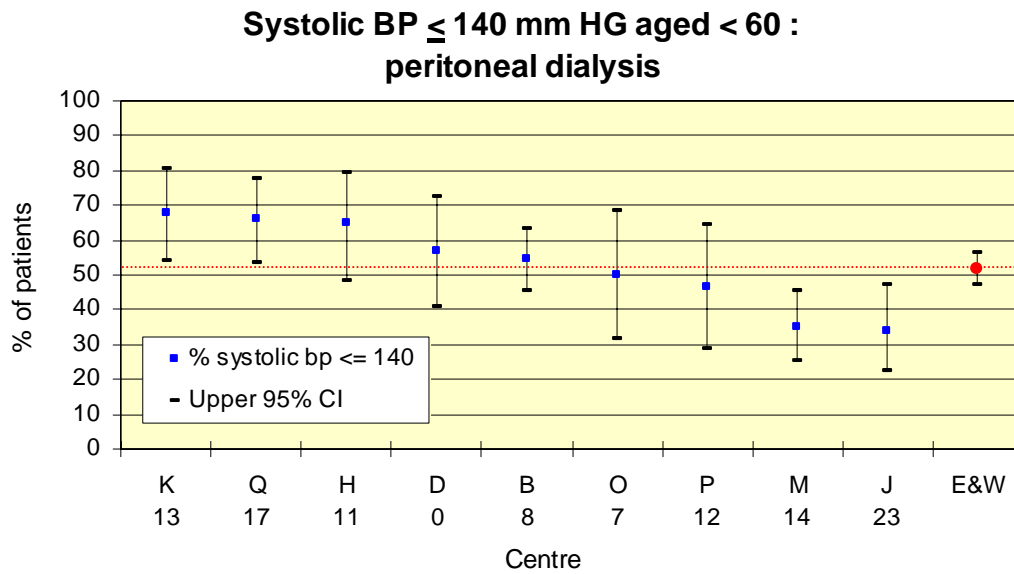
**Peritoneal dialysis**



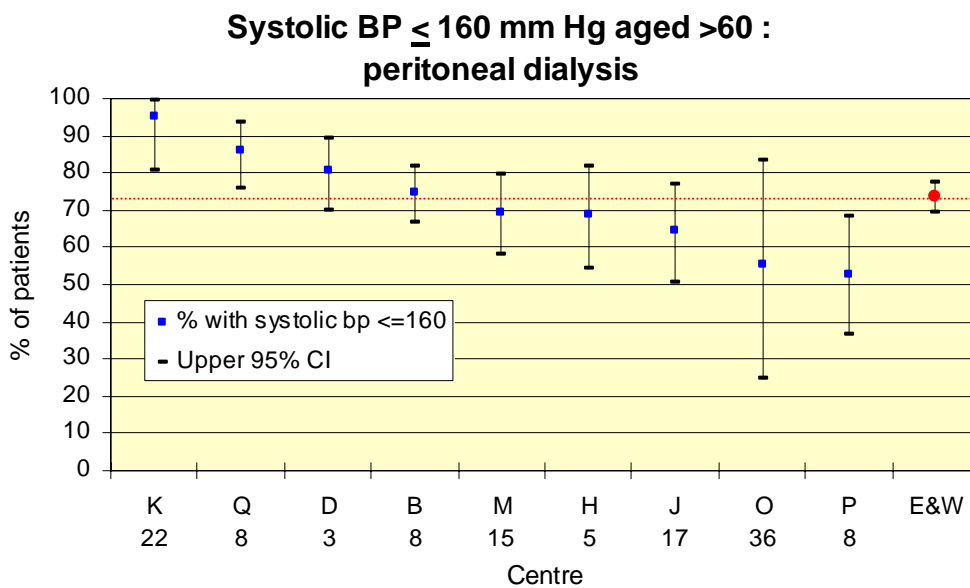
**Figure 10.9 Median systolic blood pressure age < 60 on peritoneal dialysis**



**Figure 10.10 Median systolic blood pressure age ≥ 60 on peritoneal dialysis**



**Figure 10.11** Percentage of patients with systolic BP  $\leq$  140 mm Hg age  $<$  60 : peritoneal dialysis



**Figure 10.12** Percentage of patients with systolic BP  $\leq$  160 mm HG age  $>$  60 : peritoneal dialysis

The systolic pressure of peritoneal dialysis patients is lower than that of haemodialysis patients. There are lower pressures in those under 60 than in those over 60.

## Diastolic pressure alone

### Haemodialysis

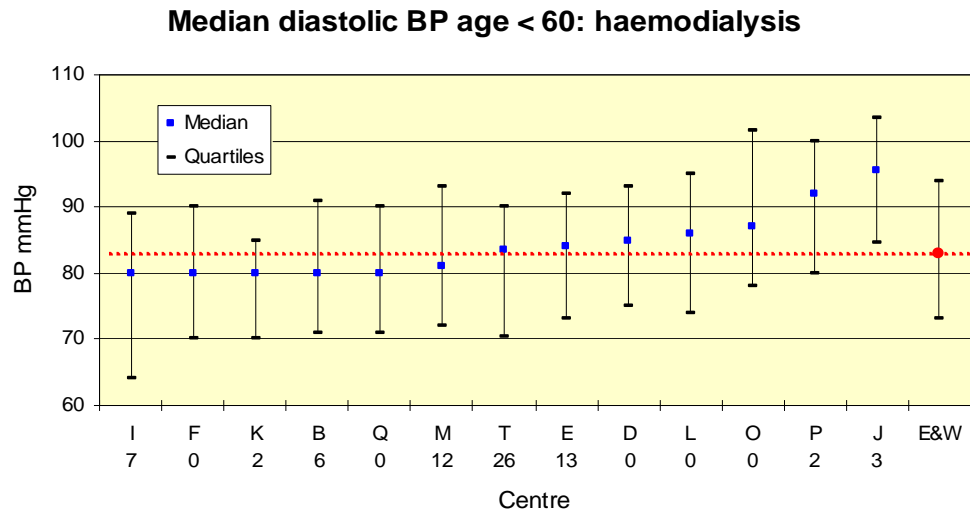


Figure 10.13 Median diastolic blood pressure age < 60 on haemodialysis

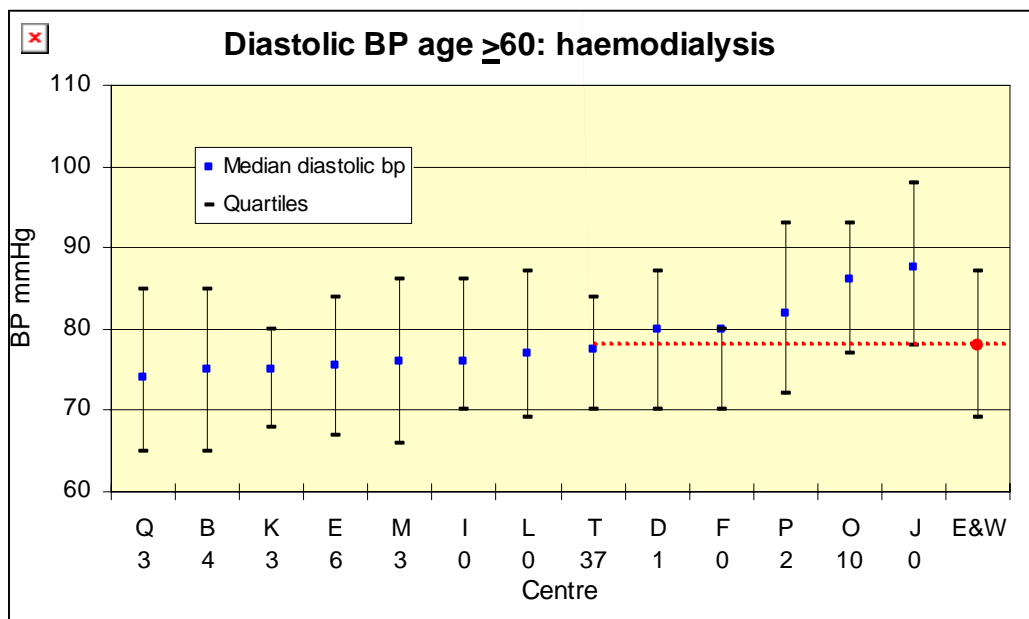
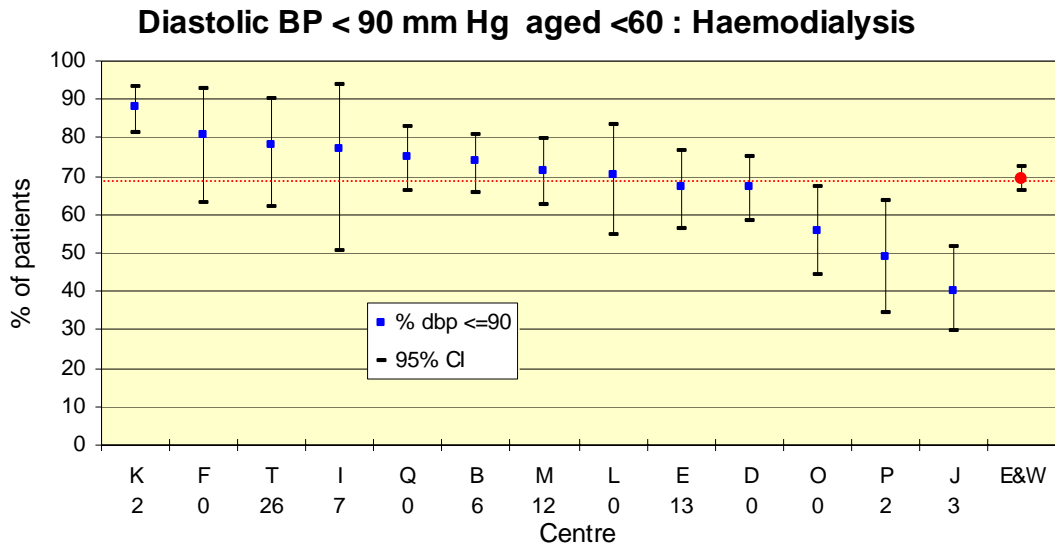
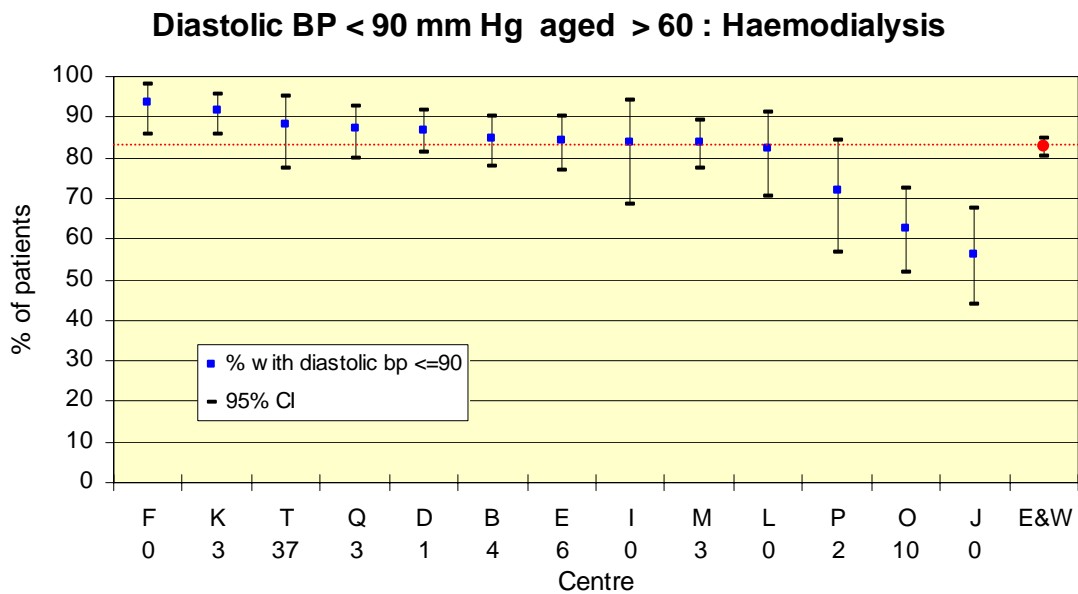


Figure 10.14 Median diastolic blood pressure age > 60 on haemodialysis



**Figure 10.15** Percentage of patients age < 60 with diastolic BP < 90 mmHg on haemodialysis



**Figure 10.16** Percentage of patients age  $\geq$  60 with diastolic BP < 90 mmHg on haemodialysis

The median diastolic pressure in older haemodialysis patients is lower than for younger patients. Many more patients achieve the diastolic pressure target than the systolic pressure target.

## Peritoneal dialysis

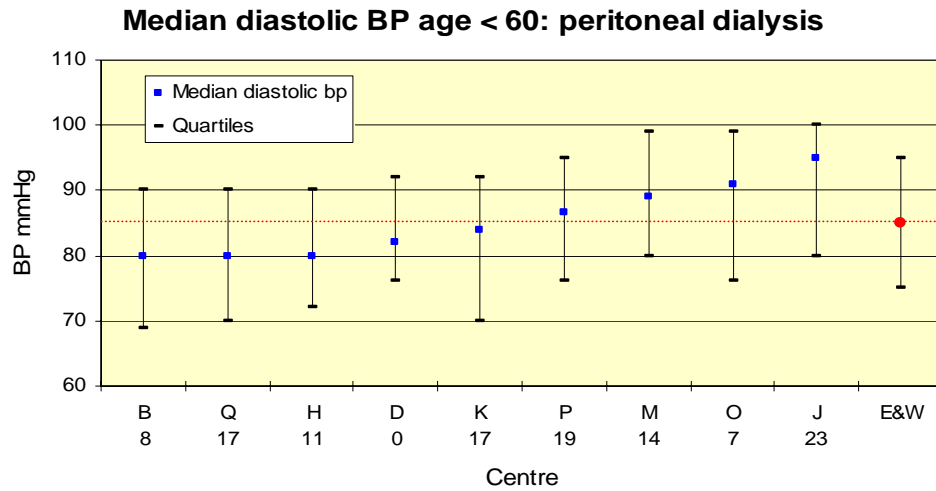


Figure 10.17 Median diastolic blood pressure age < 60 on peritoneal dialysis

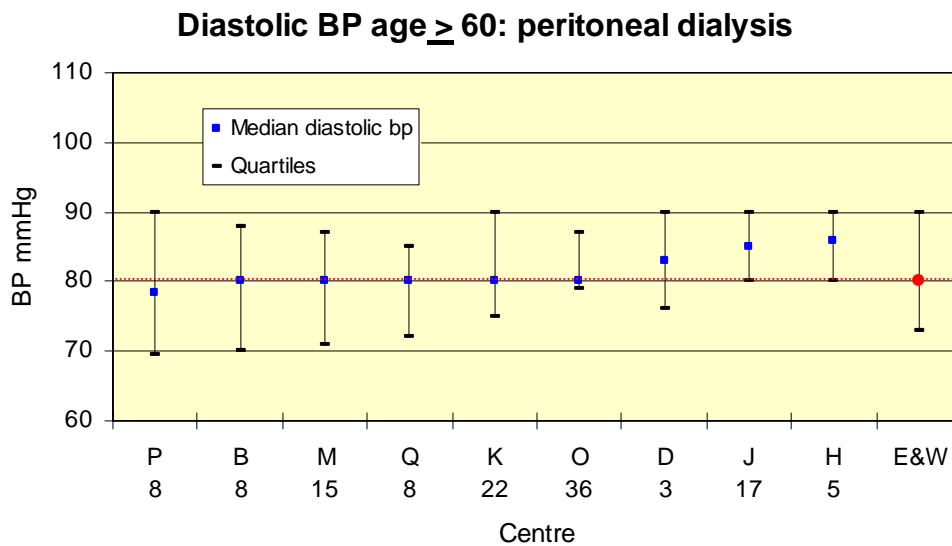
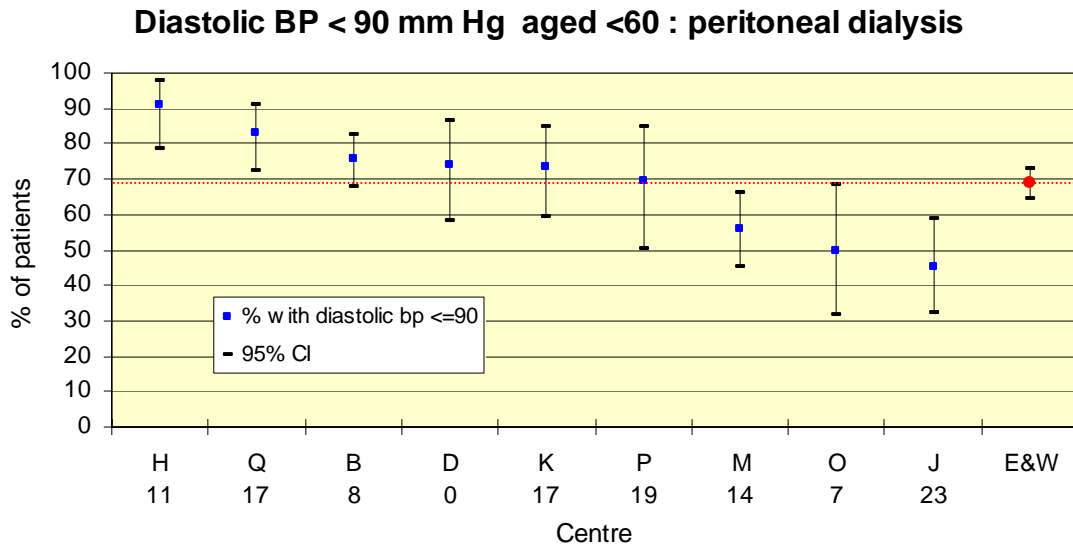
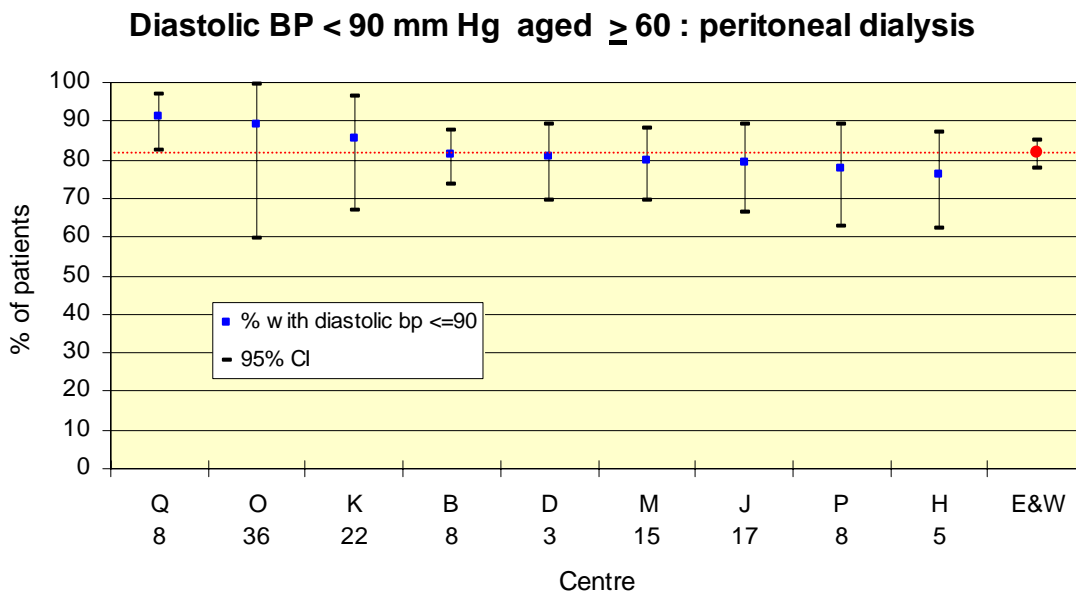


Figure 10.18 Median diastolic blood pressure age > 60 on peritoneal dialysis



**Figure 10.19** Percentage patients age < 60 with diastolic BP < 90 mmHg on peritoneal dialysis



**Figure 10.20** Percentage patients age ≥ 60 with diastolic BP < 90 mmHg on peritoneal dialysis

The median diastolic pressure in older peritoneal dialysis patients is lower than for younger patients. Many more patients achieve the diastolic pressure target than the systolic pressure target.

## Mean arterial pressure

### Haemodialysis

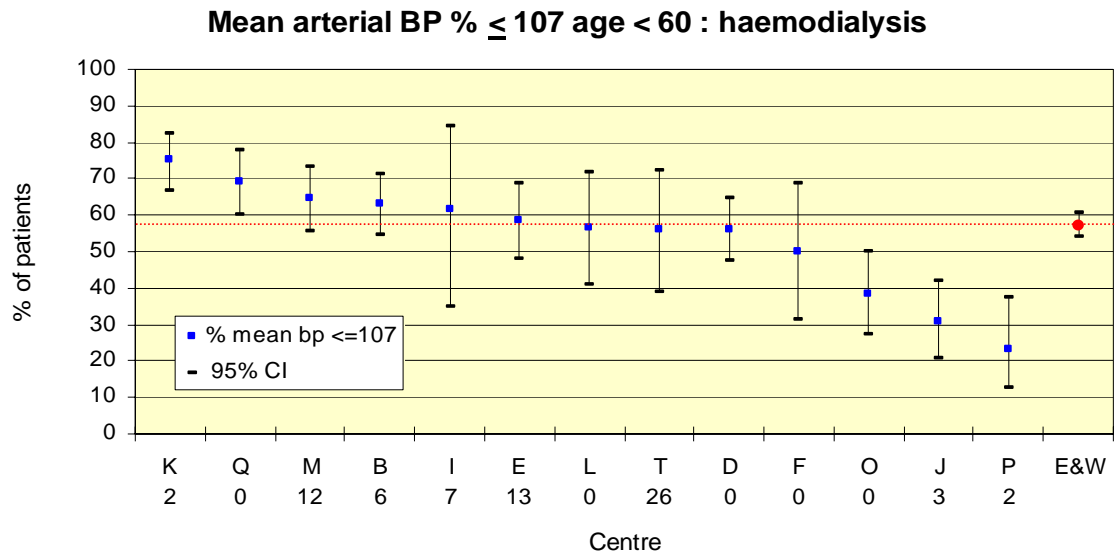


Figure 10.21 Percentage patients age <60 with mean arterial BP  $\leq 107$  on haemodialysis

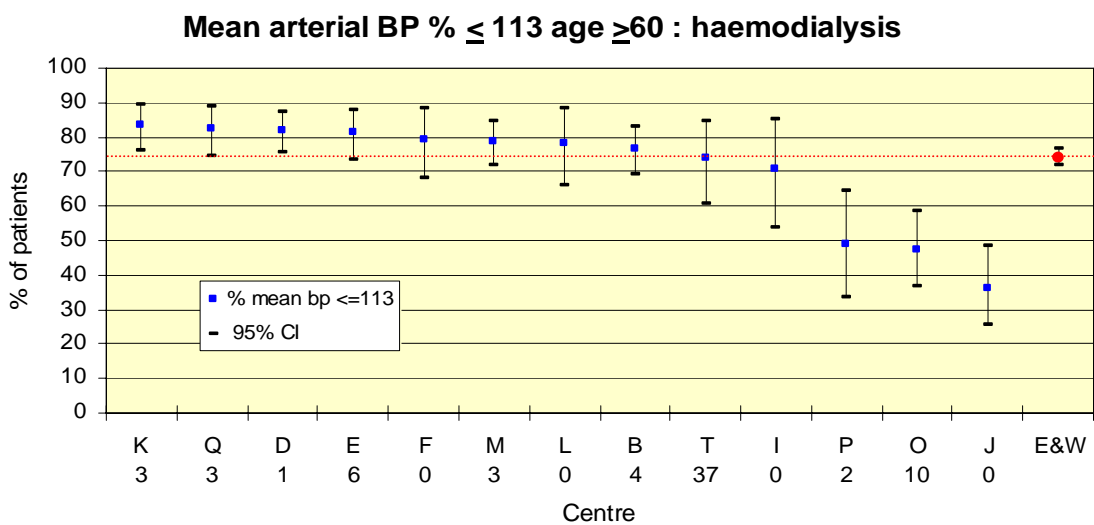
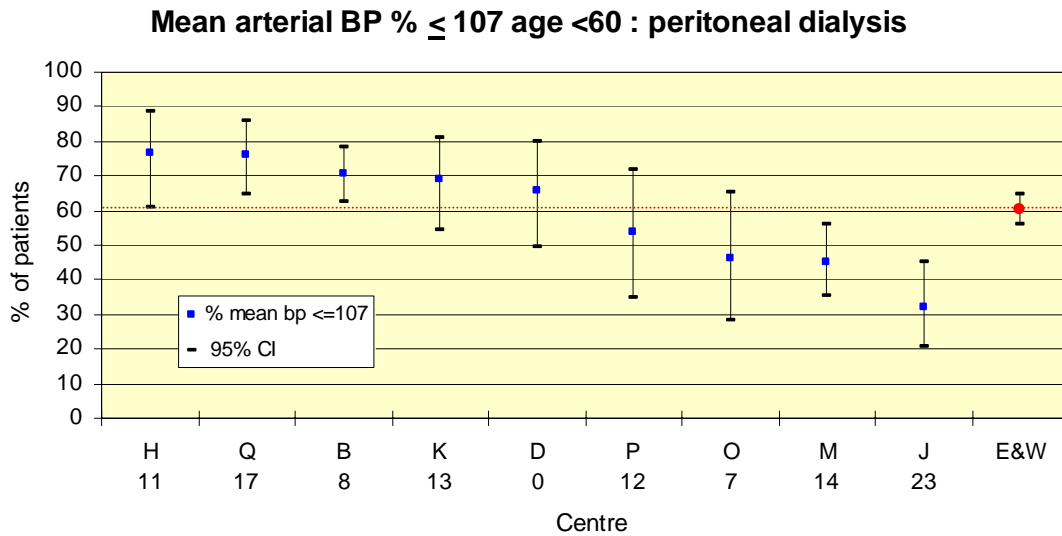
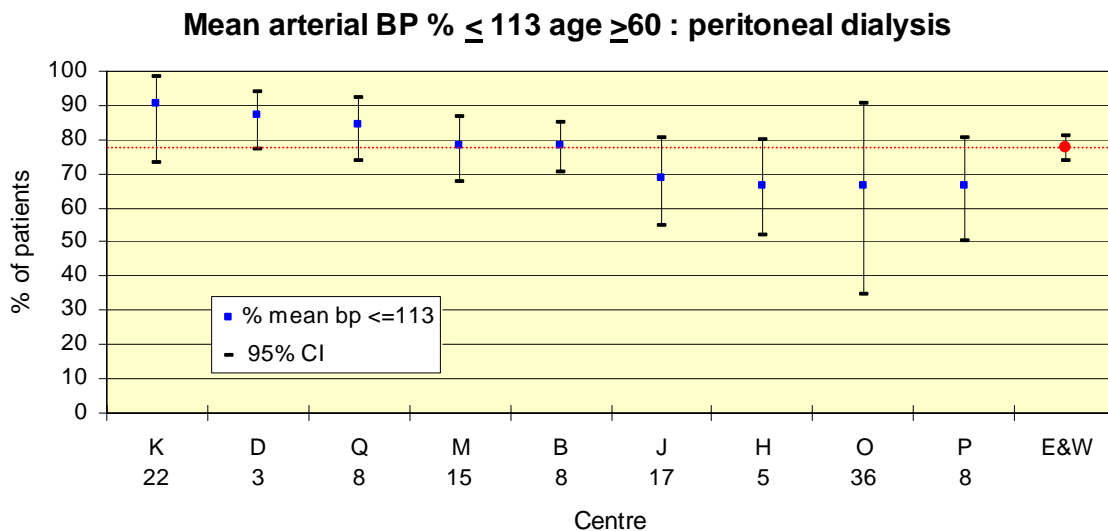


Figure 10.22 Percentage patients age  $\geq 60$  with mean arterial BP  $\leq 113$  on haemodialysis

## Peritoneal dialysis



**Figure 10.23** Percentage patients age  $< 60$  with mean arterial BP  $\leq 107$  on peritoneal dialysis



**Figure 10.24** Percentage patients age  $\geq 60$  with mean arterial BP  $\leq 113$  on peritoneal dialysis

### **Comment on mean arterial pressure data**

More patients achieve a mean arterial pressure equivalent to the recommended standards than achieve the combined arterial and diastolic standards, with little difference between the modalities. As already discussed the elderly have a higher achievement of the standard than the young because of the more liberal standard. The high achievement in the elderly is partly due to their lower diastolic pressures. The prognostic significance of the mean arterial pressure as compared with the combined systolic and diastolic standard is not certain.

## ***Comment on blood pressure data***

The proposed blood pressure Standards are difficult to attain. There are significant differences between units, but even in those achieving the lowest blood pressures nearly 50% of haemodialysis patients have a pre-dialysis pressure above the recommended standard. In four units 20% or less of younger haemodialysis patients achieve the standard. There is also a wide variation in peritoneal dialysis patients. For many units there is consistency of performance across the age range in both modalities, some consistently coming nearer to attaining the standards in all patient groups than others.

To achieve better overall standards will need considerable investment to provide more effective dialysis, better sodium balance, more outpatient staff time, and drugs. This could lead to significant patient morbidity from drug side effects and dialysis hypotension. Nevertheless most dialysis and transplant patients die of cardiovascular disease, and hypertension is one of the major factors determining cardiovascular outcome in other patient groups. Before embarking on the investment necessary to achieve better blood pressure control research is needed on the relationship of blood pressure control to outcome in end stage renal failure. This will help to determine the appropriateness of the current recommended standards for blood pressure control in end stage renal failure. Continued Registry activity in serially monitoring blood pressure and other variables in individual patients and relating these factors to eventual outcome will help to inform this debate.

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