Hypertension is common in dialysed patients (>80% at pre-dialysis state, >60% in patients with hemodialysis, >30 percent in those with peritoneal dialysis) (1). The leading cause of death in dialysed patients is cardiovascular.

The etiology of hypertension in dialysis patients is multifaceted. It includes hormone excess, volume overload, kidney failure, and medication-related factors. The relationship between hypertension and cardiovascular mortality/morbidity is apparently controversial in dialysed patients because of the high prevalence of co-morbid conditions. A recent study has demonstrated that patients with hypertension and cardiovascular disease have a significantly higher mortality rate than those without these conditions. This highlights the importance of effective antihypertensive treatment in dialysis patients.

The control of plasma volume can either normalize the blood pressure or help normalize blood pressure in dialysed patients. The algorithm for blood pressure control in dialysis patients is based on the estimation of dry weight, with the goal of maintaining a steady state of hydration. The algorithm involves the following steps:

1. **Estimate dry weight**
2. **Control of plasma volume**
3. **Evaluate for secondary forms of hypertension**
4. **Discontinue sodium modelling**
5. **Increase the dose or number of antihypertensives**

In cases of frequent episodes of hypotension during hemodialysis treatment, as hypotension is one of the important cardiovascular risk factors, limiting control of volume overload in dialysis patients has been denoted as a phenomenon. The ambulatory pressure monitoring (ABPM) appears to be reproducible and it has shown that blood pressure is frequently high pre-dialysis state, it falls immediately after dialysis, and usually lose the diurnal variation in blood pressure and consequently these patients develop nocturnal hypertension.

Pre- or post-dialysis blood pressure measurements in patients with hemodialysis may be misleading for the diagnosis of hypertension. They underestimate the mean inter-dialytic systolic blood pressure by 10 mmHg; the mean systolic blood pressure by 7 mmHg (5).

Treatment of hypertension in dialyzed patients:

<table>
<thead>
<tr>
<th>Medication</th>
<th>Primary Action</th>
<th>Secondary Action</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors</td>
<td>ACE inhibition</td>
<td>Decrease aldosterone</td>
<td><strong>Fosinopril</strong>, <strong>Captopril</strong>, <strong>Enalapril</strong>, <strong>Benazepril</strong>, <strong>Cilazapril</strong></td>
</tr>
<tr>
<td>Angiotensin II receptor antagonists</td>
<td>Block angiotensin II receptors</td>
<td>Decrease aldosterone</td>
<td><strong>Candesartan</strong>, <strong>Eprosartan</strong>, <strong>Telmisartan</strong>, <strong>Olmesartan</strong>, <strong>Losartan</strong></td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>Decrease calcium entry into vascular smooth muscle cells</td>
<td>Decrease aldosterone</td>
<td><strong>Nifedipine</strong>, <strong>Nitrendipine</strong>, <strong>Lacidipine</strong>, <strong>Isradipine</strong>, <strong>Diltiazem</strong>, <strong>Lanoxin</strong>, <strong>Hydralazine</strong></td>
</tr>
<tr>
<td>Diuretics</td>
<td>Increase sodium and water excretion</td>
<td></td>
<td><strong>Hydrochlorothiazide</strong>, <strong>Furosemide</strong>, <strong>Lisinopril</strong>, <strong>Enalapril</strong>, <strong>Lisinopril</strong>, <strong>Fosinopril</strong>, <strong>Captopril</strong></td>
</tr>
<tr>
<td>Beta blockers</td>
<td>Block beta receptors</td>
<td>Decrease aldosterone</td>
<td><strong>Propranolol</strong>, <strong>Beta blockers</strong></td>
</tr>
</tbody>
</table>

The reasonable target goal of a mean ambulatory blood pressure below 150/90 mmHg should be aimed for patients with hypertension. The management of hypertension in dialysis patients should be individualized based on patient characteristics and clinical response to therapy.
Unchanged

**Urapidil**  
Inactive metabolites may accumulate

**Doxazosin**  
First dose effect?

**Alpha-1-adrenergic blockers**  
Risk of rebound hypertension 50 %

**R**

**Timolol**  
Inactive metabolites accumulation are indicated in dialysis patients after myocardial infarction. Losartan does not enhance the risk of anaphylactoid dialyzer reactions with the ACE inhibitors. No dose adjustment is necessary in renal failure in the absence of volume depletion.

**Beta-blockers**  
Experience with these drugs in end-stage renal disease. Losartan does not enhance the risk of anaphylactoid dialyzer reactions with the ACE inhibitors. No dose adjustment is necessary in renal failure in the absence of volume depletion.

**Calcium channel blockers**  
Antihypertensive drugs

**Dose adjustment YES**

**Interval extension of NO**

**Sotalol**  
Class 3 antiarrhythmic properties

**Propranolol**  
Active metabolites accumulation interfere with bilirubin dosage

**Nadolol**  
NO

**Metoprolol**

**Timolol**

**Acebutolol**

**Calcium channel blockers**

**Sotalol**

**Bisoprolol**

**Atenolol**

**Post hemodialysis hypertensive rebound with methyldopa**

**Centrally acting anti-adrenergic drugs**

**NO**

**Unchanged**

**Unchanged**

**Unchanged**

**Unchanged**

**Unchanged**

**Unchanged**

**Use only in well-equipped hospital setting**

**Withdrawal of minoxidil** - the strongest direct vasodilator - may be effective in reducing blood pressure. Dialysed patients who are not controlled may benefit from switching to continuous ambulant peritoneal dialysis (CAPD).