

## Nurse titration clinics to achieve rapid control of blood pressure

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### Abstract

**Aims** To assess the effectiveness of a new hypertension clinic (in Auckland, New Zealand) using clinical nurse specialist appointments for drug titration.

**Methods** A new hypertension clinic was established at Waitemata District Health Board (DHB) in August 2010 using an initial registrar clinic appointment followed by fortnightly clinical nurse specialist appointments for drug titration. 50 GP-referred patients were prospectively audited and their outcomes compared to 50 patients seen in the physician hypertension clinic.

**Results** The comorbidities of the two groups were similar. 52–66% had the metabolic syndrome by IDF criteria. The mean number of clinic visits to discharge was not significantly different. The mean number of antihypertensive drugs at discharge was the same (2.8) for both clinics. There were significant reductions in systolic and diastolic blood pressures in both clinics, with a mean discharge blood pressure of 131/78 in the nurse clinic group.

**Conclusions** Nurse titration clinics are as effective as physician-only appointments in rapidly achieving target blood pressures.

Good long-term outcomes in hypertension depend on achieving target blood pressures, and, it is increasingly evident, doing so in a short period of time.<sup>1,9</sup> In the VALUE<sup>2</sup> and ASCOT<sup>3</sup> trials, blood pressures attained at 3 months predicted long-term outcome. In addition, other trials, like ALLHAT<sup>4</sup> have shown that blood pressure differences in treatment groups achieved in the first few months of a five year trial tended to persist throughout the trial, despite repeated encouragement of investigators to achieve blood pressure control.

The old adage “start low and go slow” with blood pressure medication mitigates against an aggressive approach to blood pressure management and encourages “clinician inertia” and results in patients being seen on multiple occasions with blood pressure not at target but not having their medications adjusted.<sup>5</sup>

Part of the problem is reluctance of clinicians to add medications and titrate doses upwards is a (usually misplaced) concern about inducing unacceptable hypotension,<sup>1</sup> and also a reluctance to follow the JNC-7 guideline<sup>9</sup> which suggests starting (previously untreated) patients with stage two hypertension (systolic  $\geq 160$  mmHg  $\pm$  diastolic  $\geq 100$  mmHg) on combination therapy *de novo*.

Another impediment to timely blood pressure medication titration may be the need for check laboratory tests after the addition or increase in dose of RAS-blockers (angiotensin converting inhibitors/ ACE-inhibitors and angiotensin receptor blockers/ARBs) and diuretics, with the small amount of additional effort and follow-

up that that entails. There may also be patient-related factors, for example the cost and inconvenience of attending for multiple medication adjustments with their doctor.

The Waitemata Hypertension Clinic has been operating since March 2009. At one ½ day clinic per week it sees mostly GP referrals of patients with difficult or resistant hypertension, and over 300 new referrals have been seen to date. A minority of referred patients have secondary causes of hypertension requiring specialised investigation, but in the majority, the main function of the clinic is optimisation of blood pressure with the use and titration of complex multi-drug regimens. Multiple visits are often required to achieve target blood pressure, and because of pressure on clinic space these repeat visits are either far apart, or take place at the expense of valuable new patient slots.

A potential solution to this is the use of nurse or pharmacist titration clinics with which there is experience in the United States and elsewhere.<sup>6,7</sup> The experience in some large organisations which use nurse titration clinics (e.g. Kaiser Permanente HMO in the USA) is that compliance rates are high and blood pressure control rates are excellent (80%).

In New Zealand, Clinical Nurse Specialists (CNS) are trained to provide care within a specialist area of practice, within Registered Nurse scope. This may include delegated medical responsibilities, diagnostics, and implementation of treatment protocols.<sup>8</sup> Nurse-led clinics have proven beneficial in other specialties in New Zealand and have been associated with improved patient outcomes.<sup>9-11</sup>

Nurse specialist salaries in New Zealand are approximately half of registrar salaries and one third of medical specialist salaries—if similar outcomes can be achieved in equivalent numbers of nurse-led vs doctor clinic visits, they would clearly be cost-effective. The Waitemata Renal Service appointed a Hypertension Clinical Nurse Specialist (CNS) in July 2010 and one of her roles was to establish blood pressure medication titration clinics. We audited the first 50 GP-referred patients attending these clinics, and compared their outcomes to 50 patients seen and followed up exclusively at the physician clinic.

We aimed to show that the new clinic model was at least equivalent to the previous clinic model in terms of timely achievement of blood pressure targets, and more efficient in terms of physician time. We also wished to compare number of clinic visits required to achieve target blood pressure with the two models and assess patients' satisfaction with the new model.

## Methods

50 consecutive patients referred from general practitioners with difficult or resistant hypertension were seen for their first clinic visit by a senior registrar. At this visit, a full history and physical examination were undertaken. The examination included careful resting blood pressure measurement with a manual oscillometric sphygmomanometer, according to the JNC-7 guideline.<sup>9</sup>

Special investigations were ordered as appropriate and referrals made to smoking cessation and nutritional services if needed. In addition an initial adjustment was made to their antihypertensive medication. Other drugs, specifically aspirin and statins were added as appropriate. Cases were discussed with the consultant as required.

Patients' next and subsequent visits were exclusively at the Hypertension CNS Clinic. They were seen at 2-4 weekly intervals until the blood pressure was at target (or as close to that as deemed achievable) on a regimen with which the patient felt comfortable.

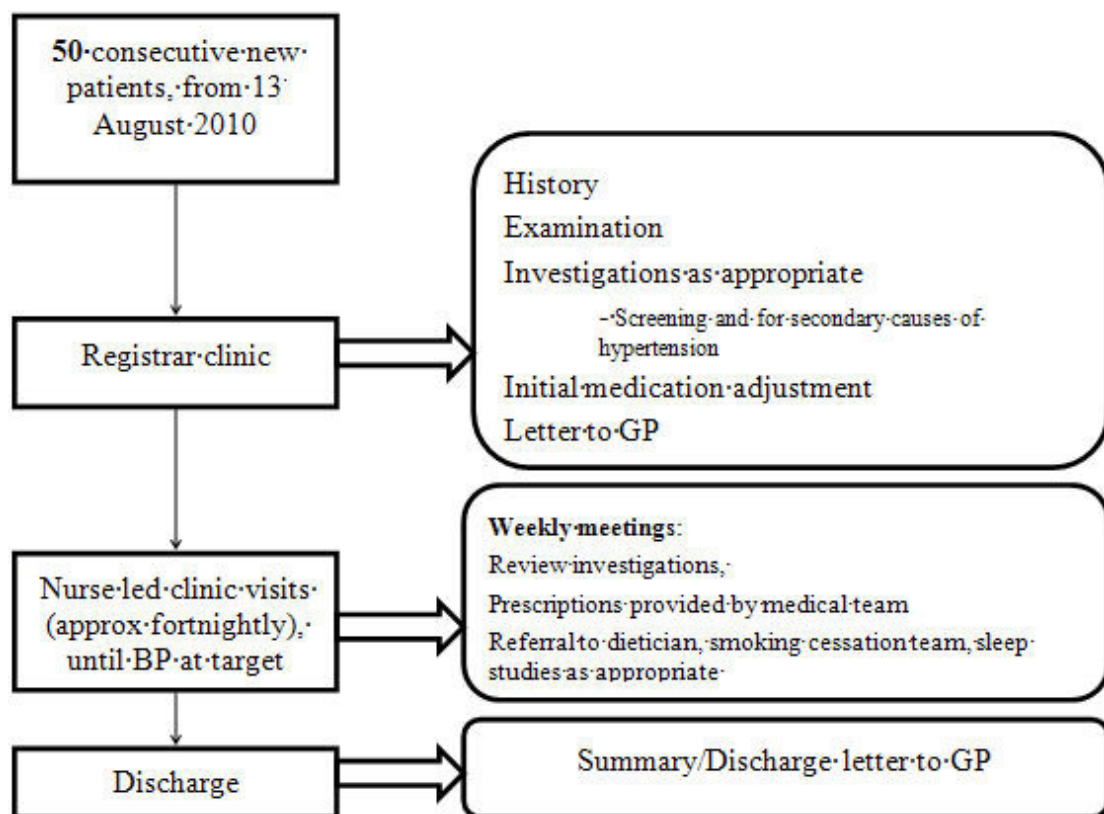
At the initial nurse titration clinic, patients' blood pressure was checked again according to JNC-7 guidelines,<sup>12</sup> using a *Microlife* automated office blood pressure monitor (*Microlife AG, Widnau, Switzerland*). Weight, height and abdominal circumference were measured. Obstructive sleep apnoea questionnaires were performed as appropriate.

Education was provided on hypertension, cardiovascular risk, lifestyle matters, and drug-related issues particularly potential side effects. Antihypertensive medication adjustment was made according to pre-arranged algorithms. Follow up laboratory tests were performed according to protocol (for example addition of, or increase in the dose of ACE-inhibitor, ARB, or diuretic required urea, creatinine and electrolytes to be rechecked 2–3 weeks after the change). A further appointment was made for two weeks' time if BP was not at target.

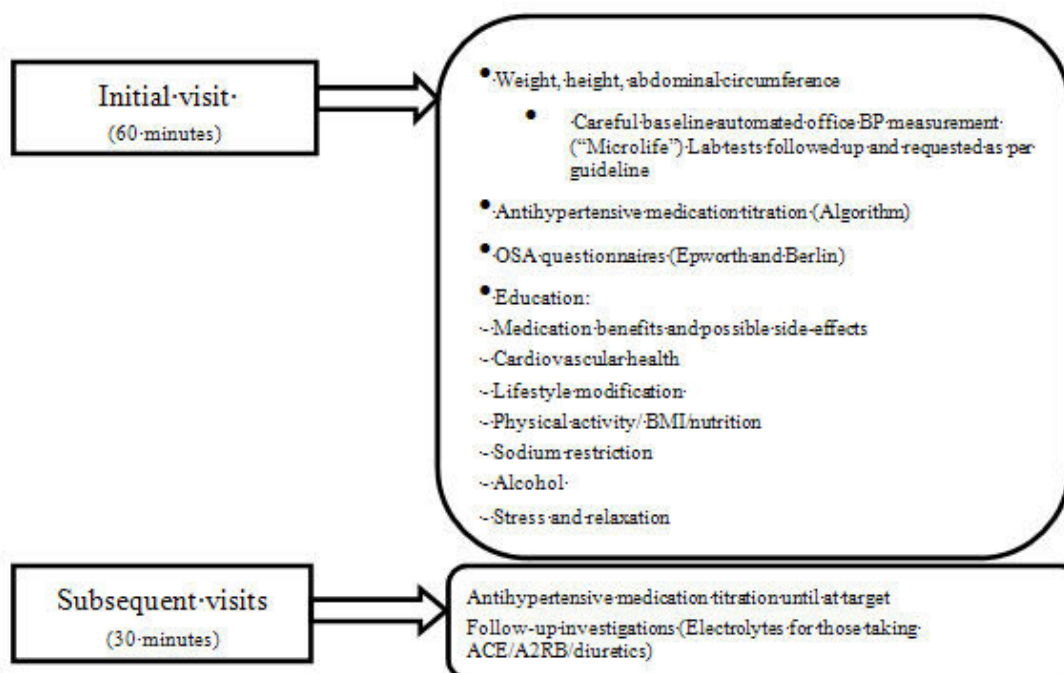
Cases were discussed at a weekly meeting between the CNS and the registrar and/or consultant, or ad hoc if needed (e.g. for deviations from the algorithms). Prescriptions were provided by the medical team. Written communication was made with the primary care physician at each visit, and once at target blood pressure a written doctor summary was provided outlining recommendations for ongoing treatment.

Data on patient demographics, comorbidities, medication changes, secondary causes of hypertension and blood pressures were recorded prospectively. Similar data from the 50 GP-referred patients seen in the physician hypertension clinic immediately prior to introduction of the new clinic were collected retrospectively, and compared to the study data.

**Figure 1. Structure of new clinic model**



**Figure 2: Content of nurse clinic visits**



## Results

50 patients were studied from each group. Their demographic details are shown in Table 1.

**Table 1. Demographic details**

Variables		Physician clinic	Nurse-led clinic
n		50	50
Gender	Male	17 (34%)	23 (46%)
	Female	33 (66%)	27 (54%)
Age (years)	mean (range)	56 (26–85)	54 (19–89)
Ethnicity	NZ European	24	28
	Other European	13	8
	NZ Maori	4	4
	Chinese	3	1
	Samoan	1	4
	East Asian	2	1
	Middle Eastern	2	0
	South Asian	1	2
	Mixed race	0	2

Their comorbidities are shown in Table 2.

**Table 2: Comorbidities**

Variables		Physician clinic	Nurse clinic
Duration of hypertension >10 years		20	6
Diabetes	Type 2	7	6
Smoking	ex-smoker	5	9
	current smoker	6	8
Microalbuminuria		13	13
eGFR	mean	73ml/min	74ml/min
Metabolic syndrome		26	34

Of the current smokers, the mean number of pack-years was 22 for the physician group, 18 for the nurse group. The number of patients with the metabolic syndrome, defined by IDF criteria<sup>13</sup>, was higher in the nurse clinic group.

There was no significant difference in the number of clinic visits required to reach target blood pressure (Table 3; p=0.16). The mean number of antihypertensive drugs at discharge was the same for both groups.

**Table 3. Visit number and drugs prescribed**

Variables		Previous patients	Nurse-led clinic
Mean number of visits(range)	registrar/physician	3.6 (1–10)	1.0 (0–2)
	nurse	–	2.2 (0–6)
	total	3.6 (1–10)	3.2 (1–6)
Mean number of drugs	at first visit	2	2.2
	at discharge	2.8	2.8

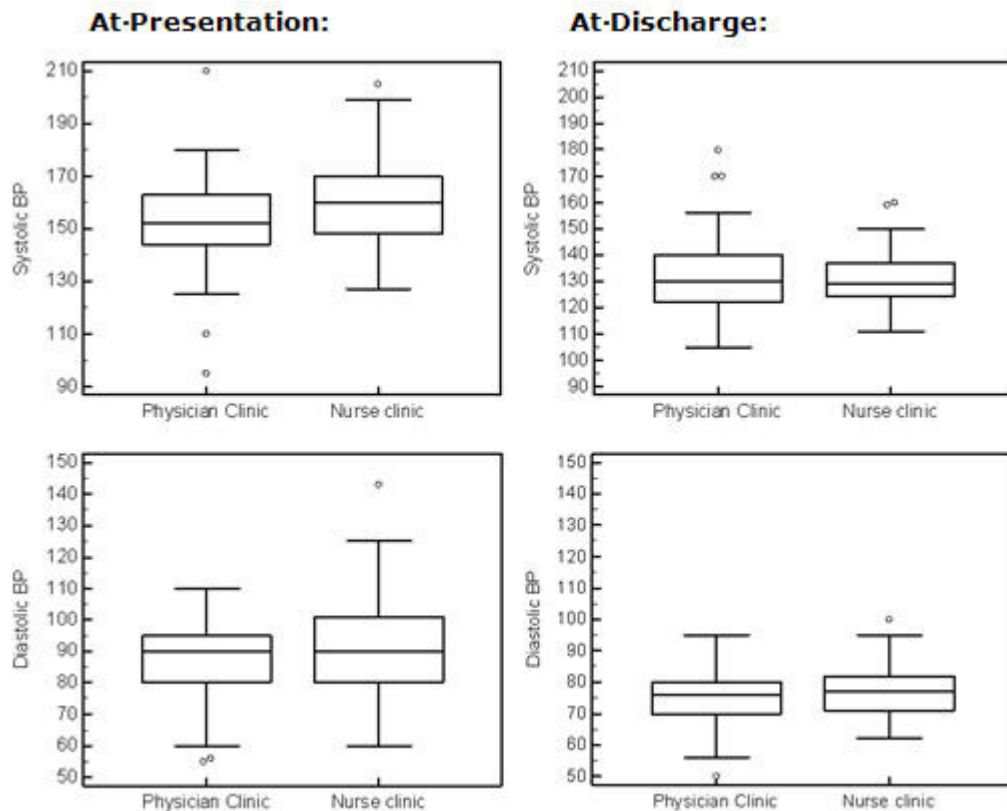
Mean blood pressure reductions are shown in Table 4.

**Table 4: Blood pressure (BP) reduction by clinic**

Variables		Previous patients		Nurse-led clinic	
		systolic	diastolic	systolic	diastolic
Mean BP (mmHg)	at first visit	154	87	161	92
	on discharge	134	74	131	78
Mean BP reduction (mmHg)		20	13	30	14

“Paired-samples” t-tests were performed to compare systolic and diastolic blood pressures at presentation and at discharge. There were significant reductions in both measurements for both clinics (table 4; p<0.01), and the reduction in systolic BP was significantly larger in the nurse clinic group (p=0.02).

**Figure 3. BP measurements at presentation to, and at discharge from each clinic.**

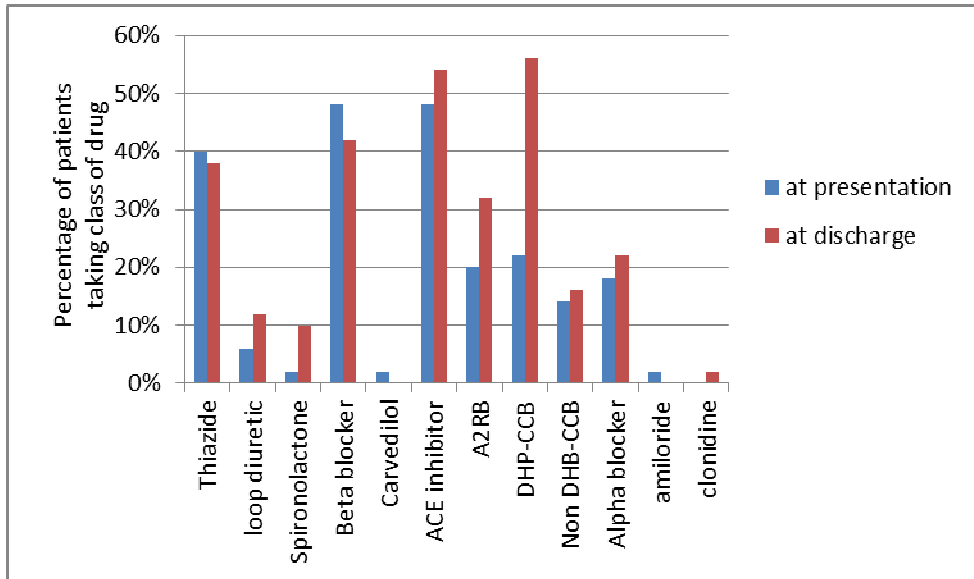


The box-and-whisker plots in Figure 5 illustrate the range of blood pressures measured at presentation to, and discharge from, each clinic. The box represents the interquartile range (IQR), the line dividing the box the median value. The whiskers indicate values 1.5 IQR lower than the first quartile and 1.5 IQR higher than the third quartile, and dots any outlying values.

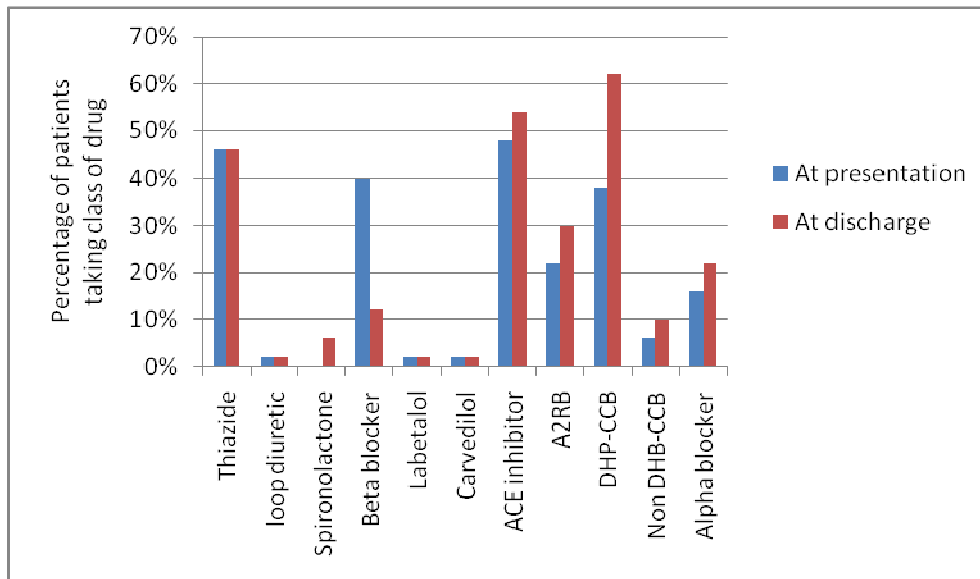
The classes of drugs added in each group are shown in Figure 4. The drugs added in each clinic were similar. The number of patients discharged on the maximum dose of a thiazide diuretic or DHB calcium channel blocker was higher in the nurse clinic than the physician clinic (Figure 5).

**Figure 4. Percentage of patients taking each class of drug at presentation, and at discharge or last follow-up**

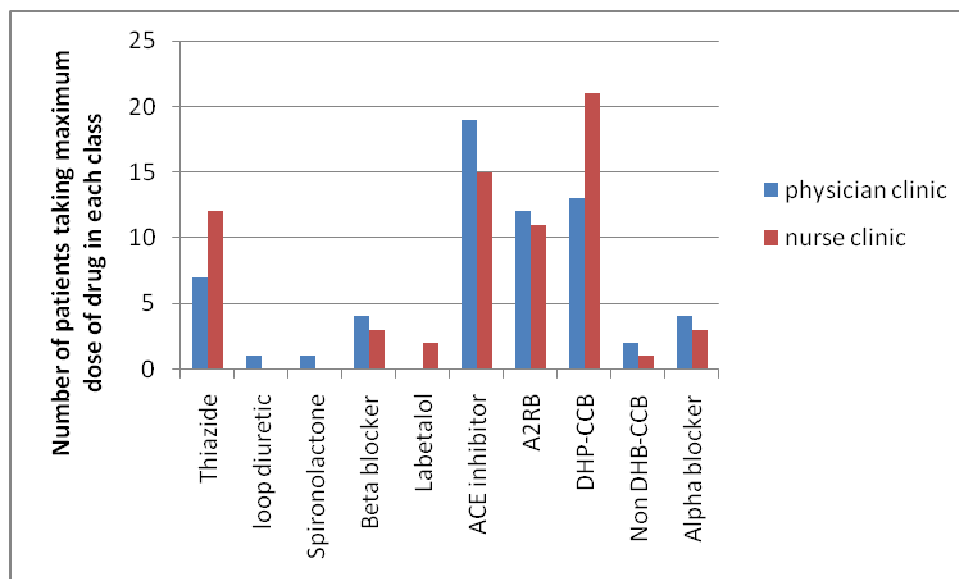
**Physician-only clinic**



**Nurse titration clinic**



**Figure 5: Number of patients taking the maximum dose in each class of drug at discharge from each clinic**



All patients were investigated for secondary causes of hypertension. In the nurse titration clinic group, three cases of possible obstructive sleep apnoea were identified all of whom are awaiting sleep studies. Two patients were investigated for possible primary hyperaldosteronism but both had normal aldosterone suppressibility on saline suppression testing. One patient had renovascular disease.

## Discussion

We trialled a new model of hypertension clinic using an initial physician visit, followed by nurse titration and education clinics, with the aim of reducing the load on the physician hypertension clinic, and achieving target blood pressures quickly and efficiently.

The groups compared were of a similar demographic, with similar comorbidities. The physician group had a longer duration of hypertension.

We found no significant difference in the total number of clinic visits needed to achieve target blood pressure between the two groups.

Blood pressures at discharge were similar between the groups, with significantly lower systolic BP reduction in the nurse clinic group. The mean number of drugs used per patient was the same.

Patients were asked to complete a questionnaire following their last visit. Feedback was uniformly positive. The majority emphasised the benefits of the extra time spent on education, which seems to have been a factor encouraging compliance both with medication and with lifestyle modifications. Patients also stated that the relaxed, unhurried atmosphere of the nurse clinic encouraged free discussion and questions, in contrast to doctor clinics where time pressure is often evident.



This model has the advantage of an initial physician assessment, and ongoing background supervision. However, because physician clinic visits are reduced by more than 2 for each patient, more new patients are able to be put through the clinic in a timely fashion (two twenty minute follow-up visits saved makes one 40-minute new patient clinic slot).

Additionally, cost-effectiveness of nurse-led clinics is evidenced by equivalent outcomes to doctor-only clinics in similar numbers of visits, given the considerably lower hourly cost of nurse specialists compared with doctors. Other advantages include accurate, unhurried electronic blood pressure measurement in the nurse clinic, and liberal time for education which is important for long-term medication compliance.<sup>14</sup>

In conclusion, hypertension nurse-specialist clinics may be a useful and cost-effective tool for management of GP-referred patients with difficult or resistant hypertension. We plan to widen the scope of the hypertension titration clinics to Nephrology patients seen in our department. We plan to encourage the development of similar projects in primary care to allow easier patient access. We continue to prospectively audit the process.

**Competing interests:** None declared.

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