Management of hypertension in the oldest old: a study in primary care in New Zealand

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Abstract

Background: the benefits of blood pressure (BP) lowering are well established except in the oldest old, and suboptimal control of hypertension has been found in many different populations.

Objective: to assess the frequency of hypertension and its adequacy of management in the oldest old in primary care.

Design: a cross-sectional study.

Setting: sixty-seven general practitioners (GPs) in three urban centres in New Zealand.

Methods: we conducted structured reviews of medical records for all ambulatory people aged ≥80 years who were registered with a participating GP. Hypertensive status and BP control were classified according to standard criteria. Logistic regression analyses were used to identify independent factors for BP control.

Results: medical records of 3,068 people (mean age 85 years, 64% female) revealed 56% to be hypertensive, of whom 94% were on treatment and 58% had controlled BP levels. Major co-morbid conditions were common among hypertensive people, and half of them had associated target organ damage. Histories of stroke, heart disease and hypercholesterolaemia were independent factors for good BP control.

Conclusion: a large proportion of the oldest old were currently receiving anti-hypertensive therapy, and most had adequately controlled BP. Previous vascular disease was the most important factor for both BP treatment and control. These findings indicate a high level of uptake of cardiovascular guidelines for older people.

Keywords: aged 80 and over, survey, blood pressure, hypertension, primary care, elderly

Introduction

As demands for health care and services increase in countries with ageing populations, great importance is placed on information pertaining to the health status of older people. Cardiovascular diseases, in particular coronary artery disease and stroke, are leading causes of death and disease burden, and hypertension is the most important modifiable risk factor for these conditions [1]. While the beneficial effects of blood pressure (BP) lowering have been generated from large-scale randomised trials [2], there are still unanswered questions about potential health gains associated with anti-hypertensive therapy in the very old [3, 4], and many people continue to have poorly controlled BP levels around the world [5]. Although the prevalence of hypertension increases with increasing age, and an upper age threshold above which anti-hypertensive therapy should not be initiated has not been defined [6, 7], there remains uncertainty regarding the balance of benefits and risks associated with BP lowering in the very old [3, 8, 9]. Not only are such people at highest risk of vascular disease, co-morbid disease and disability, but they also constitute the fastest growing segment of the population in many countries. Thus, issues of disease prevention and management...
in the oldest old are gaining increasing importance, particularly in primary care.

Several studies indicate that the management of hypertension is poor for older people, particularly in primary care [10–12]. Duggan et al. [10], for example, found that only 14% of older people with hypertension had the condition detected, treated and adequately controlled by general practitioners (GPs) in the United Kingdom. Plausible explanations for this situation include doctors’ attitudes towards anti-hypertensive treatment [13], imprecise, vague and complex guidelines [10, 14, 15] and poor adherence to therapy [16]. In this study, we evaluated the management of hypertension for very old people among a wide selection of GPs in New Zealand.

Methods

We established a network in primary care to identify older people (≥80 years) with hypertension who would be potentially eligible to participate in a randomised, controlled trial, the Hypertension in the Very Elderly Trial (HYVET) [4]. Seventy-three GPs from 28 practices in Auckland (≈940,000 people aged ≥15 years, 2001 Census), Hamilton (≈89,000) and Hastings (≈59,000), all cities within the North Island of New Zealand, were invited to participate in a medical records audit of the management of hypertension in their older patients. These GPs were not selected at random; rather they were identified on the basis of their practice type known to serve a high proportion of older people by virtue of location or demographic region, some of whom had responsibility for the care of residents of retirement villages. Residents in permanent care were excluded as they would not be eligible for the HYVET trial. The study was approved by the institutional ethics committee at each site and by the New Zealand College of General Practitioners who provided continuing medical education points to participating GPs.

Both paper and computerised medical records of participating GPs were reviewed by trained research officers between November 2003 and August 2004. Using precoded questionnaires, data were extracted from the medical records on the following demographic characteristics; dates of GP visits; history of hypertension; BP measurements in the previous 5 years; current and previous anti-hypertensive therapy; and any documentation of the presence of co-morbid conditions that included chronic obstructive pulmonary disease, atrial fibrillation, diabetes mellitus, hypercholesterolaemia and dementia and whether there was any documentation of target organ damage as indicated by stroke, ischaemic heart disease (or angina), heart failure, renal failure and peripheral vascular disease. Special note was made as to whether any anti-hypertensive medication was prescribed for a condition other than hypertension and whether a patient had been registered at a practice for <5 years.

Hypertension status was determined: (i) using the classification system of the Scottish Intercollegiate Guidelines Network (SIGN) Guideline on Hypertension of Older People [17] on the basis of the average of the three most recently recorded systolic (SBP) and diastolic (DBP) measurements as ‘normotensive’ (SBP <160 mmHg and DBP <90 mmHg), ’hypertensive’ (≥160 or ≥90 mmHg) or ‘undetermined’ if there was no clear indication for use of an anti-hypertensive agent or where <3 BP measurements were recorded in the past 5 years; (ii) if a patient’s BP was below 160/90 mmHg, but they were prescribed an anti-hypertensive agent documented specifically for hypertension or (iii) includes a patient with a diagnosis of hypertension but was prescribed an anti-hypertensive agent for another indication. Hypertensive status was further subdivided into being: ‘well-controlled’ (an average of <140/85 mmHg), ‘controlled’ (<150/90 mmHg), ‘mild’ (140–159 or 90–99 mmHg), ‘moderate’ (160–179 or 100–109 mmHg) or ‘severe’ (≥180 or ≥110 mmHg) and of established isolated systolic hypertension (≥160 and <90 mmHg). In situations where SBP and DBP fell into different categories, the higher hypertension category was applied. Lifestyle modification advice was not considered as anti-hypertensive treatment for the purposes of this study. These BP categories have been shown to be reasonably valid (sensitivity 98% and specificity 88%) by Duggan et al. [18] although better for the SBP than for the DBP thresholds.

Statistical analyses included chi-square test for the homogeneity of proportions, the Student’s t-test to examine mean differences between groups for normally distributed variables and the Wilcoxon rank sum test for non-parametric analyses. The equal proportions method assessed digit preference of BP measurements. A logistic regression model examined associations between covariates and outcomes, with adjustment for age, sex and other potential confounders including previous vascular disease, diabetes and hypercholesterolaemia. Data were reported with odds ratios (ORs) and 95% confidence intervals (CIs).

Results

A total of 67 GPs from 26 practices (Auckland 37 GPs, 19 practices; Hamilton 15 GPs, 6 practices; and Hastings 15 GPs, 1 practice) agreed to participate. A median of 42 (range 1–125) medical records were reviewed for each GP, where the median practice size was 82 (range 6–574) for very old patients. Overall, the medical records of 4,836 very old people (aged 80 years and over) were reviewed, but 1,768 (37%) of these were excluded from analyses as they either related to ‘casual’ patients (≤1 GP visit in previous 2 years or not registered with the practice) or to permanent residents of long-term care facilities. Thus, the medical records of 3,068 people (mean age 85 years, 64% female) were reviewed, and hypertension status was determined in 2,965 (97%), of whom 92% had ≥3 BP recordings within the previous 5 years. There was a significant difference between sites in the percentage of patients, for whom hypertension status could not be determined (range 2–7%, P<0.001).

According to standard definitions, 56% (95% CI 54.1–57.7) (n = 1,658) of patients were hypertensive, with 94% (95% CI 92.4–94.8) of them receiving some form of antihypertensive treatment. There was no significant difference between sites in the percentage of patients on anti-hypertensive treatment. In untreated hypertensive patients, 66% (n = 70)
had BP recordings indicative of isolated systolic hypertension (≥160/<90 mmHg), with 72% (n = 76) and 9% (n = 9) having moderate and severe hypertension, respectively.

Among patients without evidence of hypertension, so-called normotensive patients, average BP readings were SBP 135 mmHg (range 80–159) and DBP 75 mmHg (range 43–90). In contrast, average BP readings for combined treated and untreated hypertensive patients were SBP 148 mmHg (range 90–211) and DBP 78 mmHg (range 43–115). Of the treated hypertensive patients, 58% (n = 894) had BP levels that were considered controlled (<150/<90 mmHg), and, in 31% (n = 483), it was well controlled (<140/<85 mmHg). Thus, there were 42% (n = 658) of treated patients who were considered to have ‘uncontrolled hypertension’. There was a significant difference in the percentage of treated hypertensive patients who had their hypertension controlled (range 53.5–66.3%, P < 0.001) and uncontrolled (range 33.8–46.5%, P < 0.001) between sites. The proportional frequencies of levels of persistent hypertension with treatment were 47% mild (140–159/90–99 mmHg), 17% moderate (160–179/100–109 mmHg), 17% isolated systolic hypertension (≥160 and <90 mmHg) and 4% severe (≥180/≥110 mmHg). Most people received either single (37%) or dual anti-hypertensive agents (38%); only a quarter of all treated patients were prescribed ≥3 such drugs.

Hypertensive patients had their BP levels measured at significantly shorter time periods (mean 89 days, range 2–805) compared with normotensive patients (mean 150 days, range 4–946) (P < 0.0001). This time period also differed significantly between treated (84 days, 2–805) and untreated (155 days, 16–532) hypertensive patients (P < 0.0001). In contrast, there was no significant difference between untreated hypertensive patients with controlled and uncontrolled hypertension in relation to average time between BP measurements.

Major co-morbid conditions (Table 1) were evident in 63% (n = 1,046) of hypertensive patients and included ischaemic heart disease (25%), hypercholesterolaemia (13%), atrial fibrillation (12%), heart failure (11%), diabetes (11%), stroke (7%) and chronic obstructive airways disease (6%). Moreover, 49% (n = 755) of these patients had documented associated target organ damage, and these patients were on significantly more treatment than hypertensive patients without target organ damage (P = 0.006). Although patients with diabetes mellitus were more likely to be on anti-hypertensive treatment than were patients without diabetes mellitus (P = 0.01), they were less likely to have good BP control, as summarised in Table 2. The other factors of history of stroke, heart disease and hypercholesterolaemia, but not gender and peripheral vascular disease, were significant independent predictors of good BP control. We were unable to include other exposures and socioeconomic variables in the model, as these data were either absent from medical records or unreliable.

### Table 1. Characteristics of older people

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD) age for determined patients, years</td>
<td>85</td>
<td>(3.69)</td>
</tr>
<tr>
<td>Women</td>
<td>1973</td>
<td>64</td>
</tr>
<tr>
<td><strong>Hypertension status</strong></td>
<td>1658</td>
<td>56</td>
</tr>
<tr>
<td><strong>Current use of anti-hypertensive therapy</strong></td>
<td>1552</td>
<td>94</td>
</tr>
<tr>
<td><strong>Co-morbidity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischaemic heart disease and/or angina</td>
<td>488</td>
<td>25</td>
</tr>
<tr>
<td>Hypercholesterolemia</td>
<td>245</td>
<td>13</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>229</td>
<td>12</td>
</tr>
<tr>
<td>Heart failure</td>
<td>212</td>
<td>11</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>202</td>
<td>11</td>
</tr>
<tr>
<td>Stroke</td>
<td>131</td>
<td>7</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>124</td>
<td>6</td>
</tr>
<tr>
<td>Transient ischaemic attack</td>
<td>107</td>
<td>6</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>78</td>
<td>4</td>
</tr>
<tr>
<td>Dementia</td>
<td>71</td>
<td>4</td>
</tr>
<tr>
<td>Chronic renal failure</td>
<td>38</td>
<td>2</td>
</tr>
</tbody>
</table>

*Patient may have more than one co-morbidity.

### Table 2. Variables tested for association with blood pressure (BP) control in hypertensive patients in a multiple logistic regression model

<table>
<thead>
<tr>
<th>Factor</th>
<th>Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.99 (0.96–1.03)</td>
</tr>
<tr>
<td>Female</td>
<td>0.97 (0.75–1.25)</td>
</tr>
<tr>
<td><strong>Medical history</strong></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>1.39 (1.01–1.91)</td>
</tr>
<tr>
<td>Heart disease</td>
<td>1.65 (1.30–2.11)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.23 (0.86–1.75)</td>
</tr>
<tr>
<td>High cholesterol</td>
<td>1.60 (1.16–2.20)</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>1.46 (0.93–2.29)</td>
</tr>
</tbody>
</table>

*BP control was defined as an average of systolic BP <140 mmHg and diastolic BP <90 mmHg.

**Discussion**

This study provides new information on the frequency of treatment and control of hypertension specifically in people aged 80 years or more living without major dependency in the community. The finding of approximately half (56%) of the oldest old people with hypertension in our study is comparable to figures obtained from other surveys that have included older adults, including a recent national health survey in New Zealand [19]. However, that the majority of people with hypertension were on anti-hypertensive therapy, with over half (58%) of them having controlled BP, is a considerable improvement from the suggested ‘rule of halves’ [20] for the management of hypertension, where only between 14 and 33% of older people are effectively treated for hypertension [10–12]. Even in those with ‘uncontrolled hypertension’, most people had BP that was only mild-moderately elevated in this study.

On the basis of substantial randomised evidence, albeit acquired in mainly people between the ages of 60 and 80 years, lifestyle changes are recommended as first-line therapy for people with mild hypertension unless there are
associated cardiovascular risk factors or evidence of target organ damage which place them at high risk [8]. As indicated in the SIGN guidelines [17], even a small reduction in BP may translate into large absolute benefits in high-risk individuals. We are, therefore, somewhat reassured by finding that the factors that determined BP control in the oldest old were major cardiovascular risk factors, namely prior stroke, heart disease and high cholesterol, in the hypertensive octogenarians in this study. Nearly, half of hypertensive patients had evidence of target organ damage, which together with diabetes mellitus was positively associated with treatment status. Interestingly, though, the presence of diabetes was not related to BP control after adjusting for other variables in the model, raising the possibility that aggressive BP management in this patient group is perceived to be less important than among those with previous vascular events. An alternative explanation may be that BP is more difficult to control in those with diabetes. In addition, hypercholesterolaemia did not appear to influence treatment decisions. In a recent article, MacMahon and colleagues [21] suggested that the decision to treat hypertension should be on the basis of a patient’s absolute cardiovascular risk rather than a traditional BP-based definition of hypertension. The SIGN guidelines [17] also state that the decision to treat should be on the basis of a structured assessment of cardiovascular risk. Our data would appear to suggest a low threshold to use of hypertensive therapy based on BP levels, but that treatment is optimised in those with high absolute risk in primary care.

Studies have shown that both SBP and DBP levels tend to diverge with age, resulting in a frequency of at least 20% of people with isolated systolic hypertension among octogenarians in many Western countries [9]. We found that 66% of untreated and 17% of treated hypertensive patients displayed isolated systolic hypertension, suggesting that some GPs may be prioritising their decisions about treatment on the basis of DBP rather than SBP levels, which is contrary to recommendations made on the basis of a meta-analysis of three trials specifically in older people undertaken by Staessen et al. [9].

Our findings have some limitations. General practitioners were not selected at random, and their practices served predominantly urban centres, although economic and social pressures result in a propensity for older people to move from rural communities to urban centres to access community and other services in New Zealand. Data collected from medical records are prone to recording errors and do not allow reasons for shortfalls in clinical practice, such as gaps in physician knowledge, incomplete records or poor adherence to medication, to be easily identified. Although we applied consistent definitions for hypertension status and BP control [22, 23], bias may have been introduced by effects of terminal digit preference, whereby clinicians tend to read BP values to the nearest 0 (or 5 mmHg), which may have influenced our classification of hypertension status [24]. We assessed there to be a considerable terminal digit preference in this study: 58% of SBPs and 64% of DBPs were rounded to 0, and there was an absence (or very low levels) of recordings for any odd terminal digit, but there was no rounding to 5 as a terminal digit. Even so, altering the definition of controlled hypertension from 150/90 mmHg to 149/89 mmHg had negligible effect on the proportion (54 to 52%) of hypertensive patients with controlled BP in this study. It is likely that our use of valid and reliable criteria [18, 23] in a large number of people allowed BP levels close to true levels to be derived from regression to the mean, thus reducing any bias associated with terminal digit preference.

A meta-analysis of trials specifically undertaken in very old people suggests a benefit of anti-hypertensive therapy in terms of preventing stroke and heart failure but not for all-cause mortality [3]. However, the small numbers of endpoints resulted in high levels of uncertainty around the treatment effects. The HYVET [4] study is being undertaken to provide sufficient level of evidence of the balance of benefits and risks of anti-hypertensive therapy in the oldest old to guide clinical practice. Until the results of HYVET [4] are available, the 2001 SIGN guidelines state that ‘chronological age should not be a barrier to the judicious use of anti-hypertensive therapy’, although in frailter patients, the treatment choice will depend on individual circumstances such as age, functional status and co-morbidity [17]. Our study indicates ready uptake of guideline recommendations into primary care in New Zealand.

In summary, we have shown better management of hypertension among very old people in the community compared to the historical ‘rule of halves’, with most hypertensive people living at home being readily identified and treated and half appearing to achieve effective BP control. However, these data may be biased towards those people with a survivor advantage, and more randomised data, such as from the HYVET trial, are required to establish whether BP lowering and control later in life translate into improved active life expectancy, as has been shown in other age groups.

Key points

- In an audit of medical records of over 3,000 of the oldest old (aged 80 years and older) at GP practices, the majority with hypertension is prescribed anti-hypertensive therapy.
- Over half of the oldest old have controlled BP, a considerable improvement from the historic ‘rule of halves’.
- Previous vascular disease was the most important factor for both BP treatment and control.
- These findings indicate a high level of uptake of cardiovascular guidelines for the oldest old.

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References


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